US Caribbean Marine Spatial Planning Workshop

Puerto Rico
August 31, 2023 - September 1, 2023
The Courtyard Marriott Isla Verde, San Juan

National Centers for Coastal and Ocean Science
National Marine Fisheries Service

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US Caribbean
Marine Spatial Planning Workshop

NOAA's National Centers for Coastal Ocean Science (NCCOS) in partnership with the NOAA National Marine Fisheries Service (NMFS), Southeast Fisheries Science Center (SEFSC) are working to build spatial planning capacity in the US Caribbean Region.

Workshop Goals

➢ Learn more about NOAA's marine spatial planning approaches and activities
➢ Inventory available spatial data for the US Caribbean
➢ Document data shortcomings and gaps
➢ Increase local capacity and resources for regional ocean spatial planning
➢ Further develop a community of stakeholders to inform future marine planning efforts

Workshop Sessions

1. ***National Security:*** locations of various military or NASA operation areas

1. ***Industries:*** locations of vessel traffic, key industrial concerns (shipping lanes, pipelines, submarine cables), buoys and weather forecasting devices

1. ***Fisheries:*** areas where both commercial and recreational fisheries are active

1. ***Natural Resources:*** information about protected species and sensitive habitats

1. ***Cultural and Social Resources:*** cultural and recreational uses of the environment, social vulnerability, demographic data, archaeological sites

1. ***Metocean and Other:*** meteorological and oceanographic conditions (temperature, wind, currents, etc.), shoreline, water depth and slope (bathymetry), boundaries

Core Data Questions

1. What are your concerns or questions about the data layers just presented?

1. Are you aware of any data that are missing from the list but available? If so, can you provide a point of contact from whom we could acquire the data?

1. What data gaps exist? In considering the list of identified data gaps in group discussion, what stands out as a high priority?

Regional Ocean Spatial Modeling:

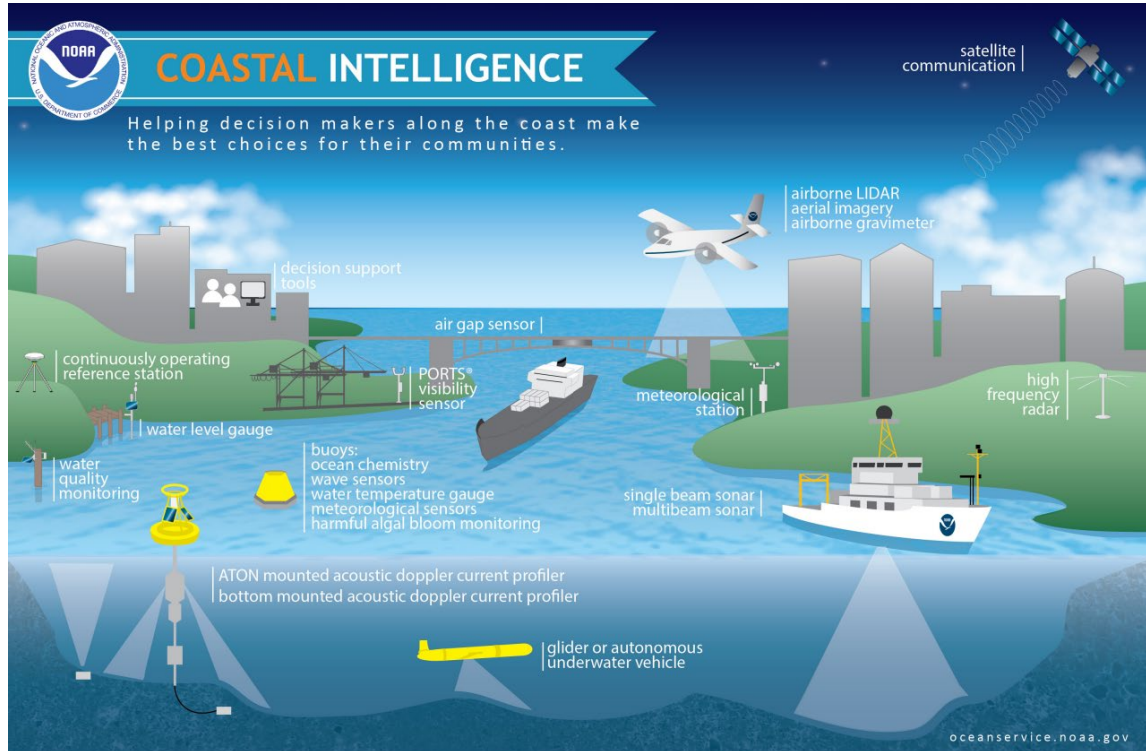## How NOAA is providing operational marine spatial planning

National Oceanic and Atmospheric Association
National Centers for Coastal and Ocean Science

James Morris

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Ocean Intel and the Blue Economy

Ocean Industries

- Tourism and Recreation
- Defense and Public Administration
- Offshore Oil and Gas
- Transportation
- Fisheries and other Bio-products
- Shipbuilding
- Power Generation
- Construction
- Research and Education
- Professional and Business Services*

NOAA Spatial Planning

- Completed 50+ analyses in last 5 years
- Aquaculture Opportunity Areas
- Wind Energy Areas
- State-designated aquaculture use areas
- Spatial planning for Ports/Harbors and farm specific sites
- Tool/app development
- Stakeholder engagement
- Geospatial science and services

Gulf of Mexico WEAs
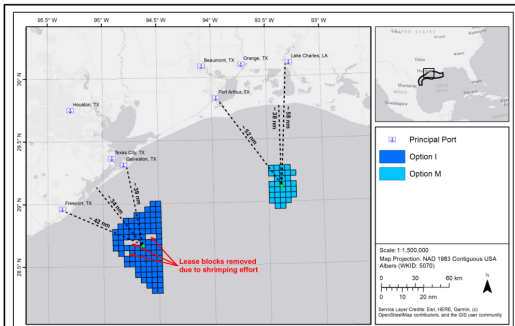
Central Atlantic WEAs
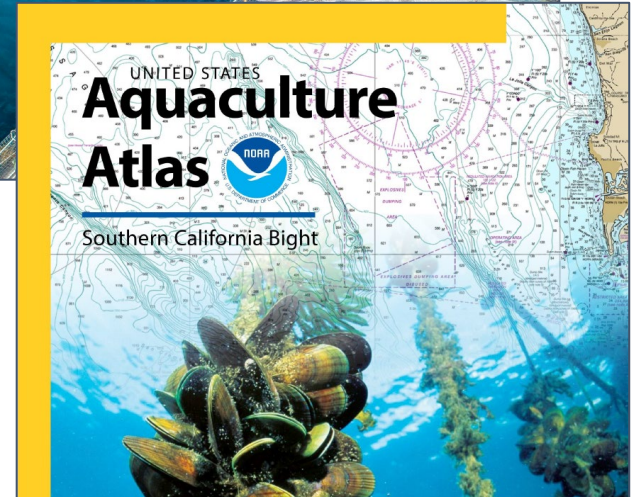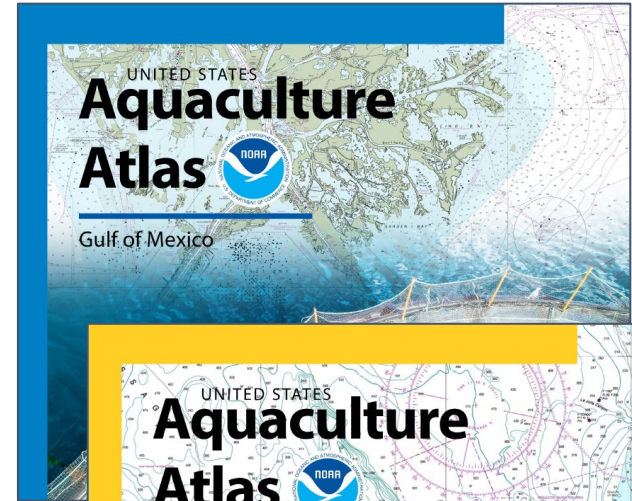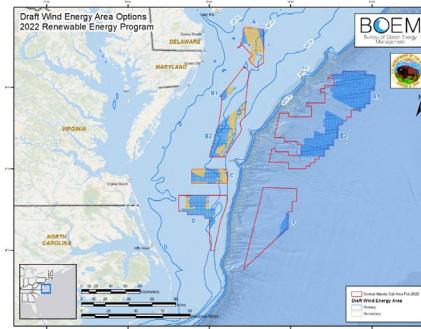
New Federal Partnerships

National Oceanic and Atmospheric Administration
U.S. Department of Commerce

Home / News & Features

NOAA and BOEM announce interagency collaboration to advance offshore wind energy
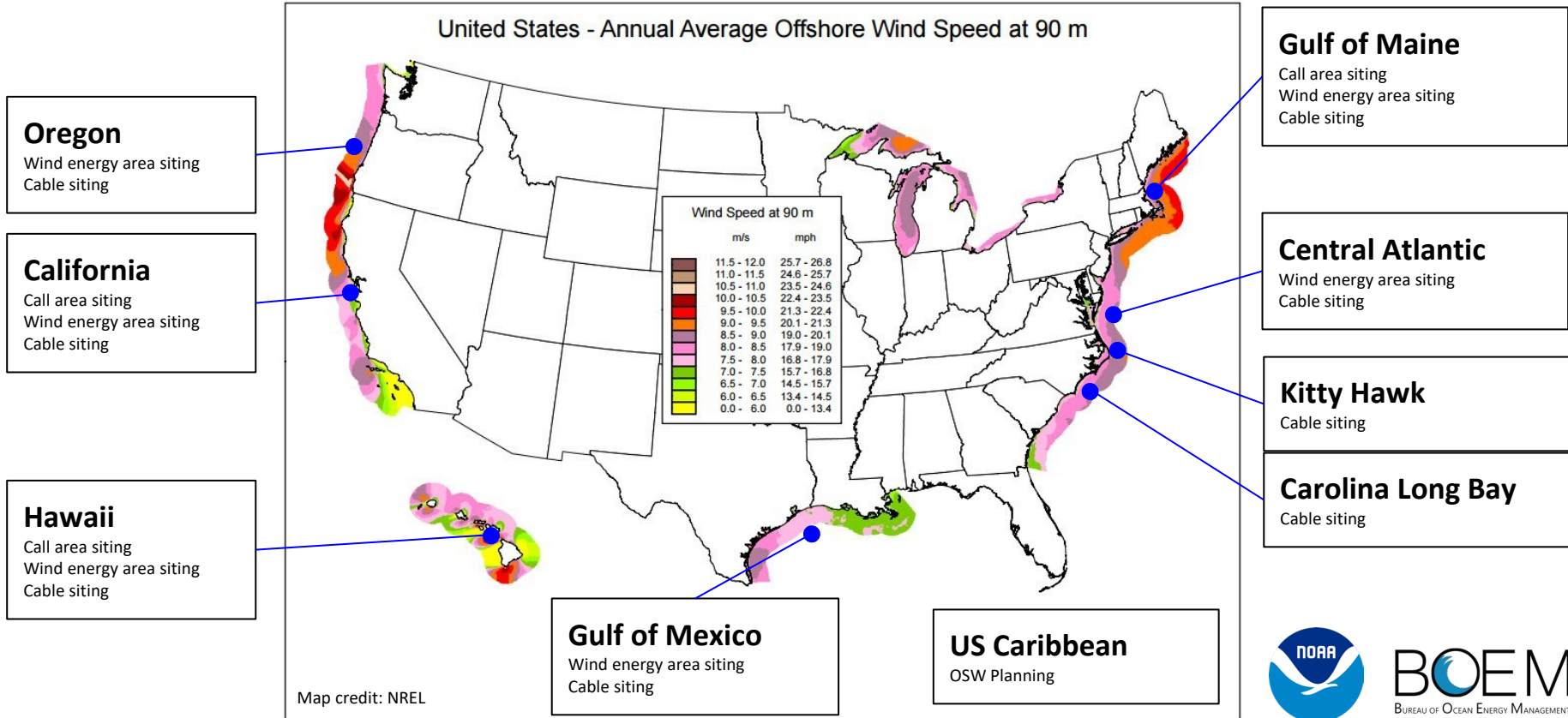
HOME | NEWSROOM

BOEM Enhances its Processes to Identify Future Offshore Wind Energy Areas
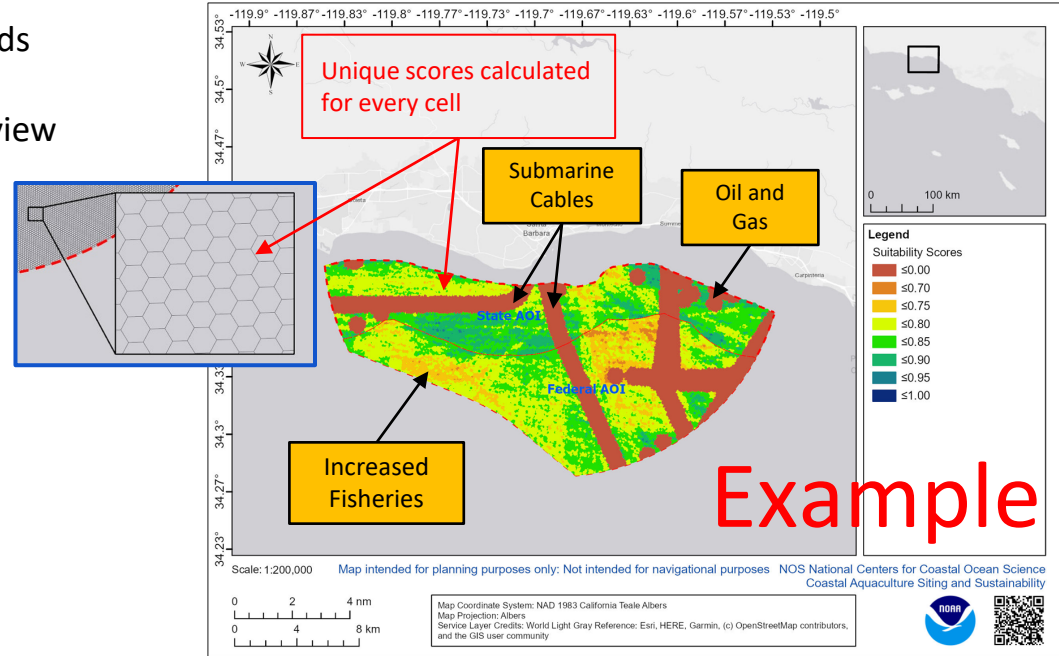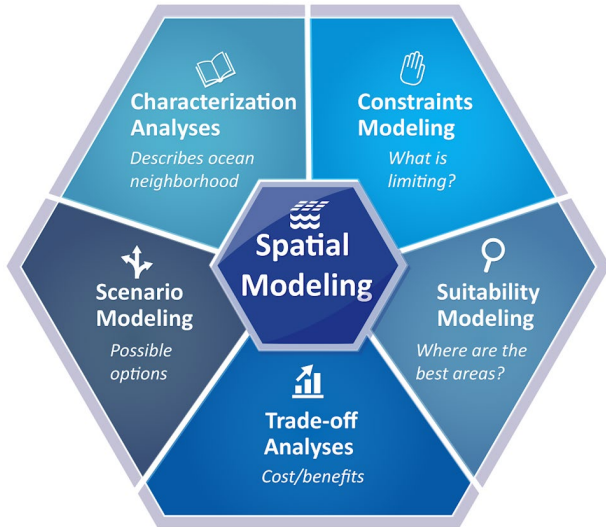
New Changes in Response to Public Input

09/16/2022

BOEM
BUREAU OF OCEAN ENERGY MANAGEMENT

Wind Spatial Models Underway

United States - Annual Average Offshore Wind Speed at 90 m

Oregon
Wind energy area siting
Cable siting

California
Call area siting
Wind energy area siting
Cable siting

Hawaii
Call area siting
Wind energy area siting
Cable siting

Gulf of Maine
Call area siting
Wind energy area siting
Cable siting

Central Atlantic
Wind energy area siting
Cable siting

Kitty Hawk
Cable siting

Carolina Long Bay
Cable siting

Gulf of Mexico
Wind energy area siting
Cable siting

US Caribbean
OSW Planning

Wind Speed at 90 m

m/s	mph
11.5 - 12.0	25.7 - 26.8
11.0 - 11.5	24.6 - 25.7
10.5 - 11.0	23.5 - 24.6
10.0 - 10.5	22.4 - 23.5
9.5 - 10.0	21.3 - 22.4
9.0 - 9.5	20.1 - 21.3
8.5 - 9.0	19.0 - 20.1
8.0 - 8.5	17.9 - 19.0
7.5 - 8.0	16.8 - 17.9
7.0 - 7.5	15.7 - 16.8
6.5 - 7.0	14.5 - 15.7
6.0 - 6.5	13.4 - 14.5
0.0 - 6.0	0.0 - 13.4

Map credit: NREL

NOAA

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Why Spatial Suitability Modeling?

- Analyzes the "whole ecosystem"
- Identifies hotspots of conflict and opportunity
- Requires set rules (weights) and methods
- Provides defensible and transparent methods
- Allows for scenario planning
- Supports comprehensive environmental review

A **spatial suitability model** weights locations relative to each other based on a given criteria.
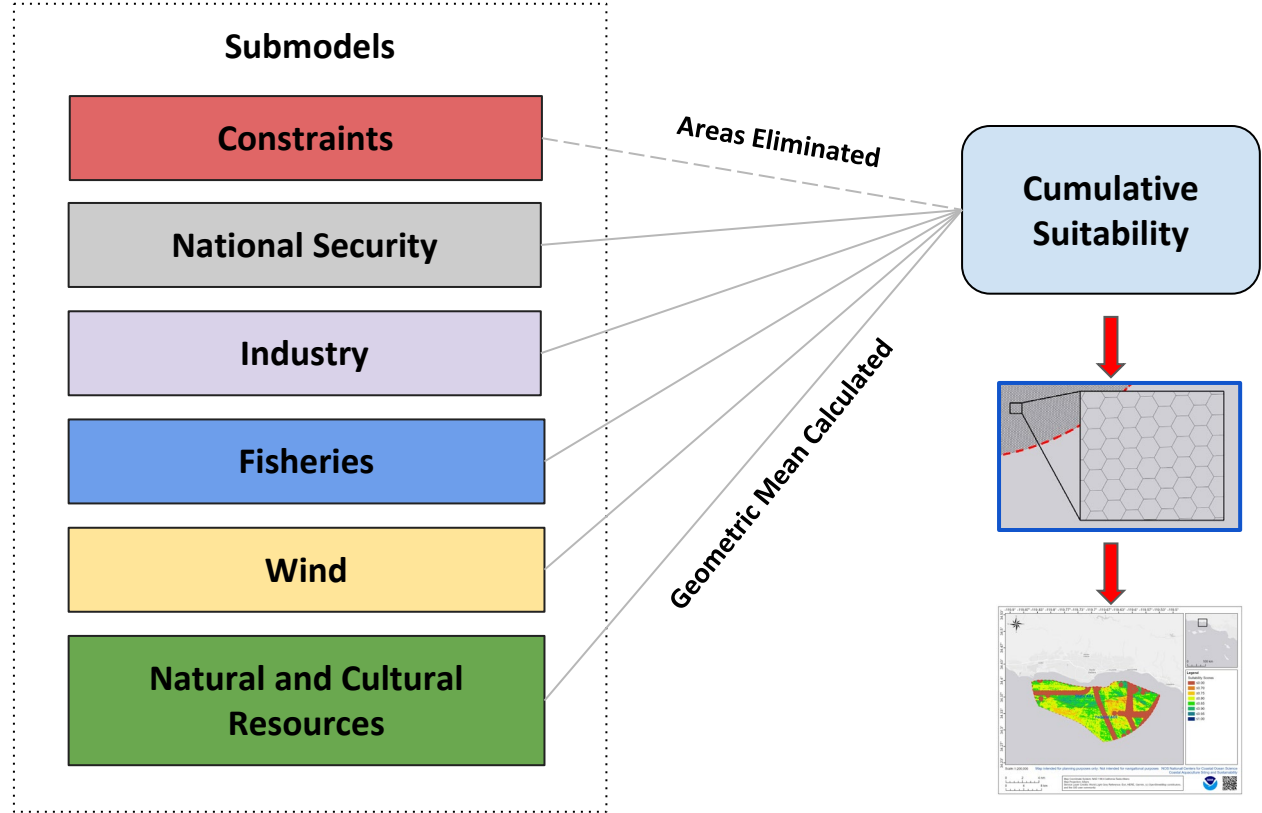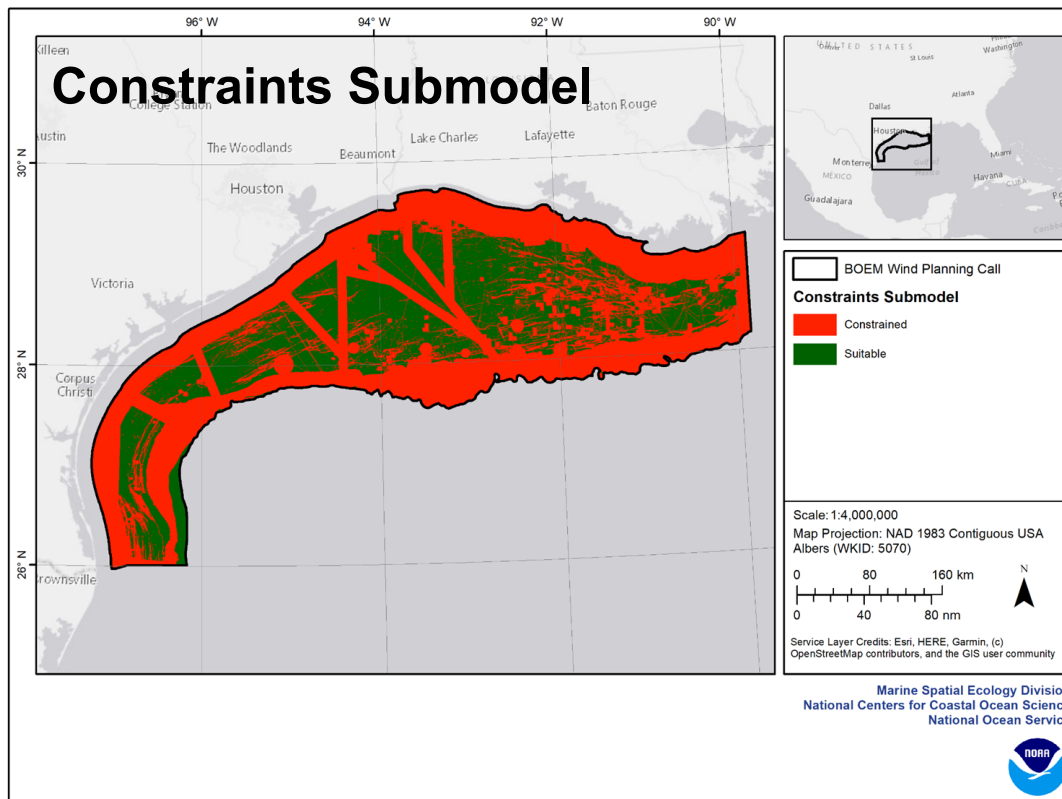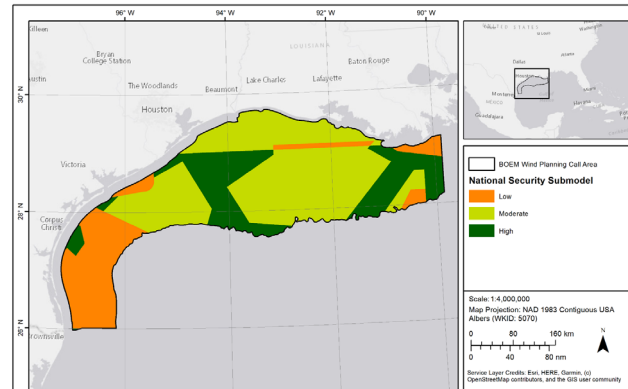

Characterization Analyses — Describes ocean neighborhood

Constraints Modeling — What is limiting?

Spatial Modeling

Scenario Modeling — Possible options

Suitability Modeling — Where are the best areas?

Trade-off Analyses — Cost/benefits

Unique scores calculated for every cell

Submarine Cables

Oil and Gas

Increased Fisheries

State AOI

Federal AOI

Example

Legend
Suitability Scores
≤0.00
≤0.70
≤0.75
≤0.80
≤0.85
≤0.90
≤0.95
≤1.00

Scale: 1:200,000   Map intended for planning purposes only: Not intended for navigational purposes   NOS National Centers for Coastal Ocean Science Coastal Aquaculture Siting and Sustainability

Map Coordinate System: NAD 1983 California Teale Albers
Map Projection: Albers
Service Layer Credits: World Light Gray Reference: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
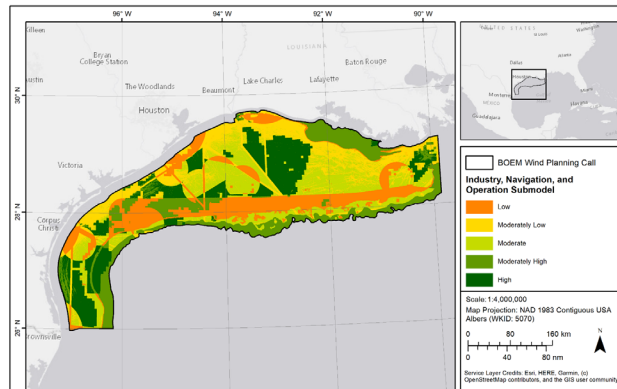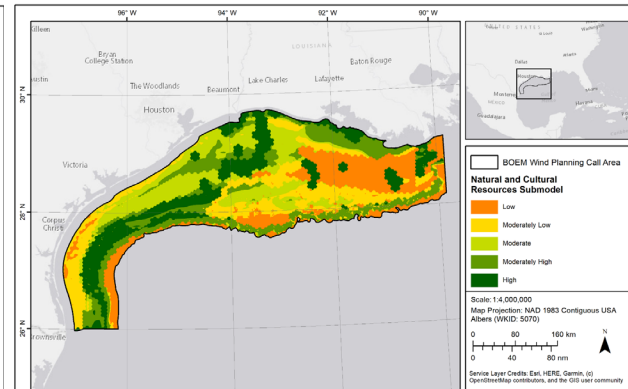
Spatial Suitability Model

Gulf of Mexico WEAs Example
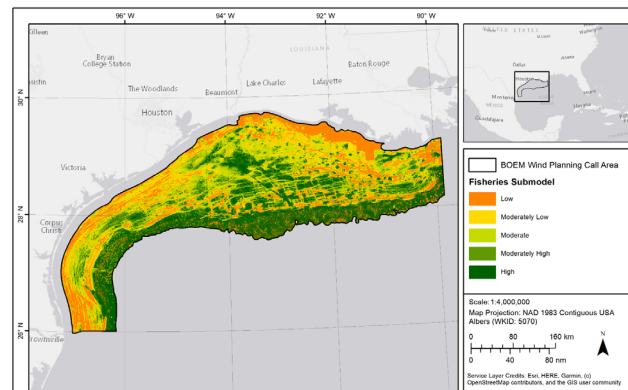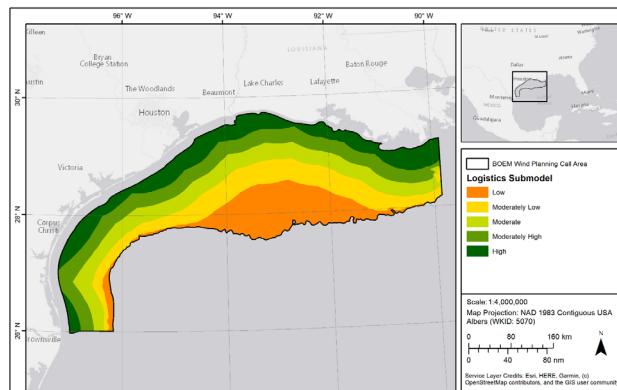
Submodel Suitability

National security

Industry and Operations

Natural and Cultural Resources

Fisheries

Logistics
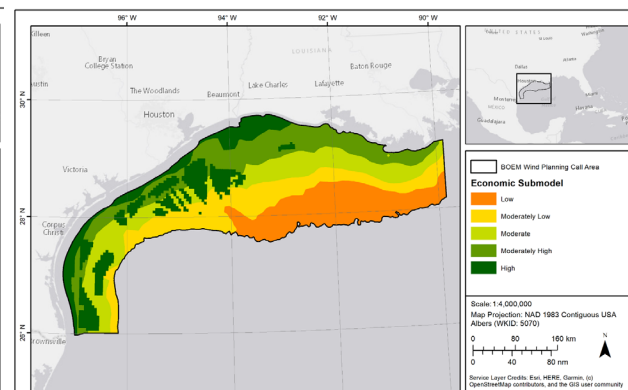
Economics

Gulf of Mexico WEA Model
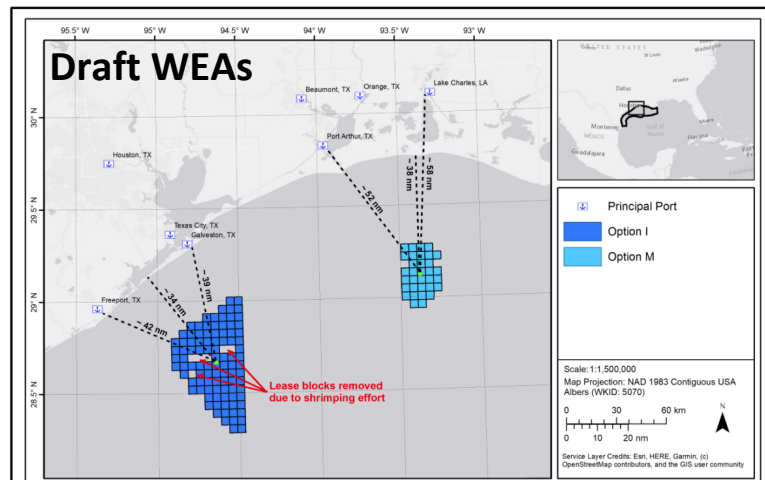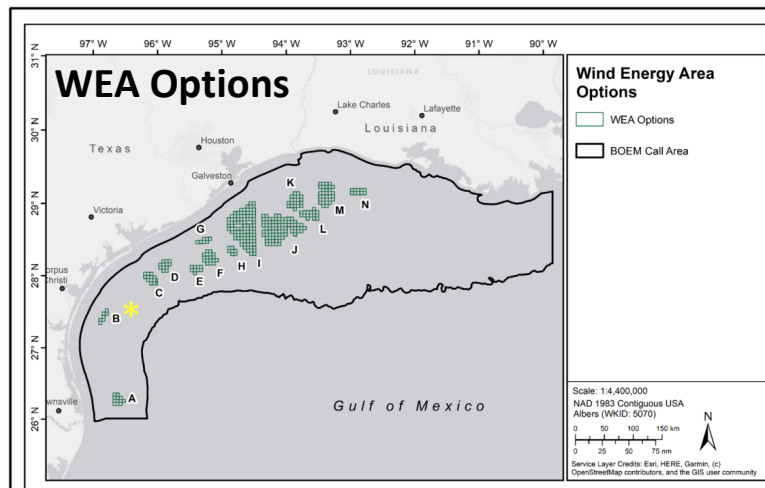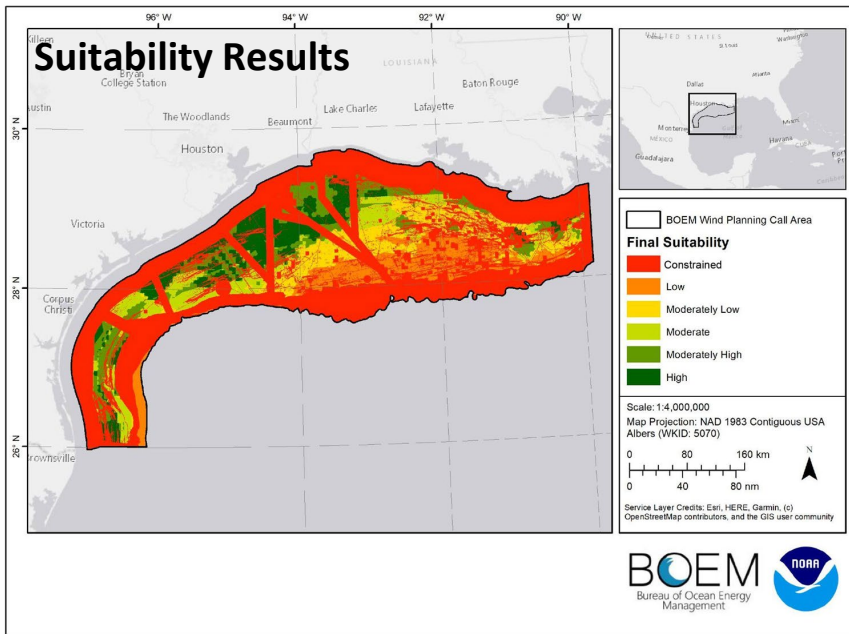
Model Performance Examples

Deconflict fisheries
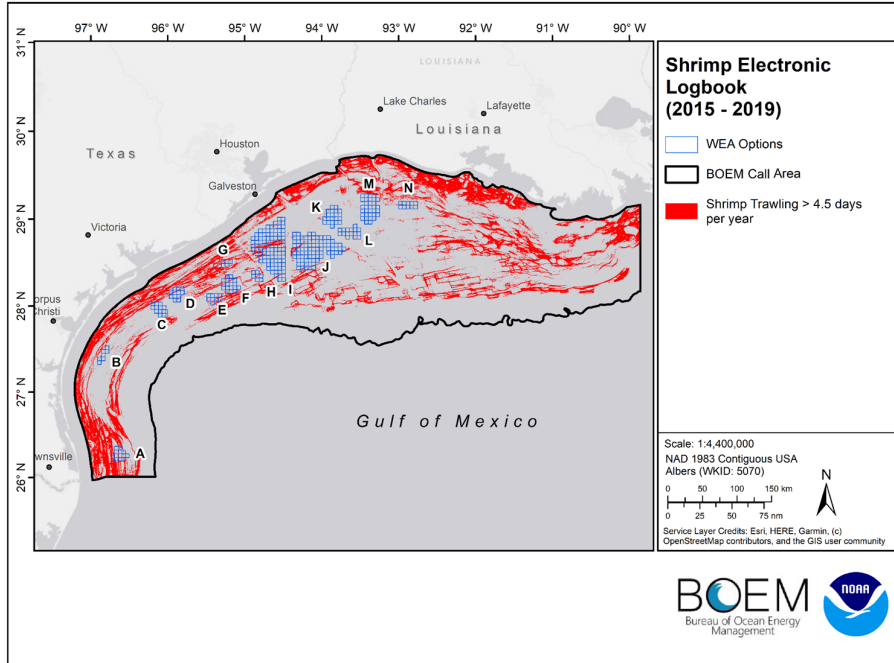
Deconflict shipping industry
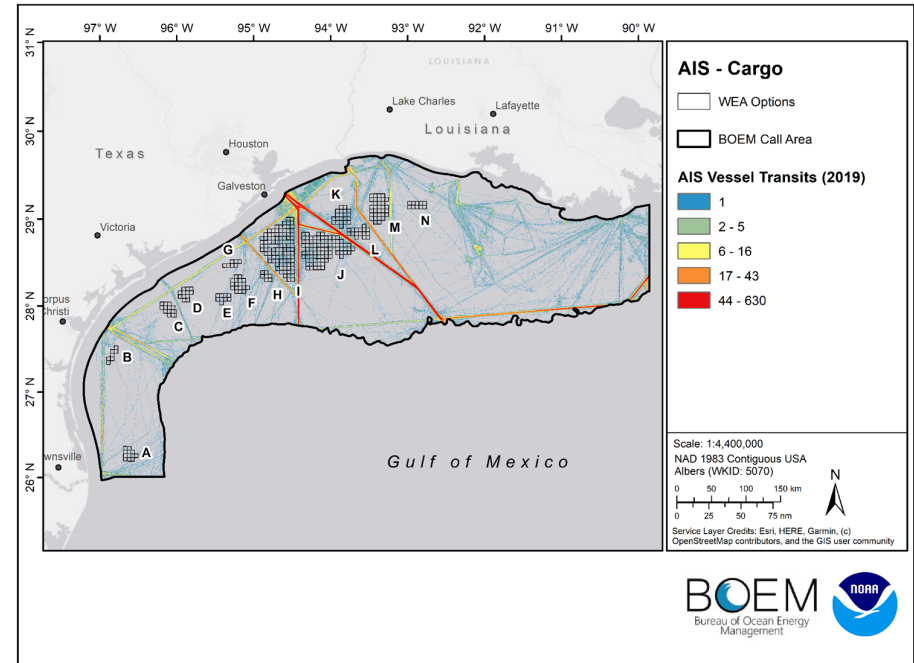
Current Data Inventory

1. National Security
2. Industries
3. Fisheries
4. Natural Resources
5. Cultural and Social Resources
6. Metocean and Other

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National Security

Locations of various military or NASA operation areas

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National Security

Danger Zones and Restricted Areas: areas used for especially hazardous operations or otherwise restricted access

Data Link / Metadata Link

Formerly Used Defense Sites (FUDS): locations where military activity occurred and the various trajectory and ranges from these areas where weapons were deployed or tested

Data Link / Metadata Link

Unexploded Ordnance Areas: explosive weapons (bombs, bullets, shells, grenades, mines, etc.) that did not explode when they were employed and still pose a risk of detonation

Data Link

Type: Polygon
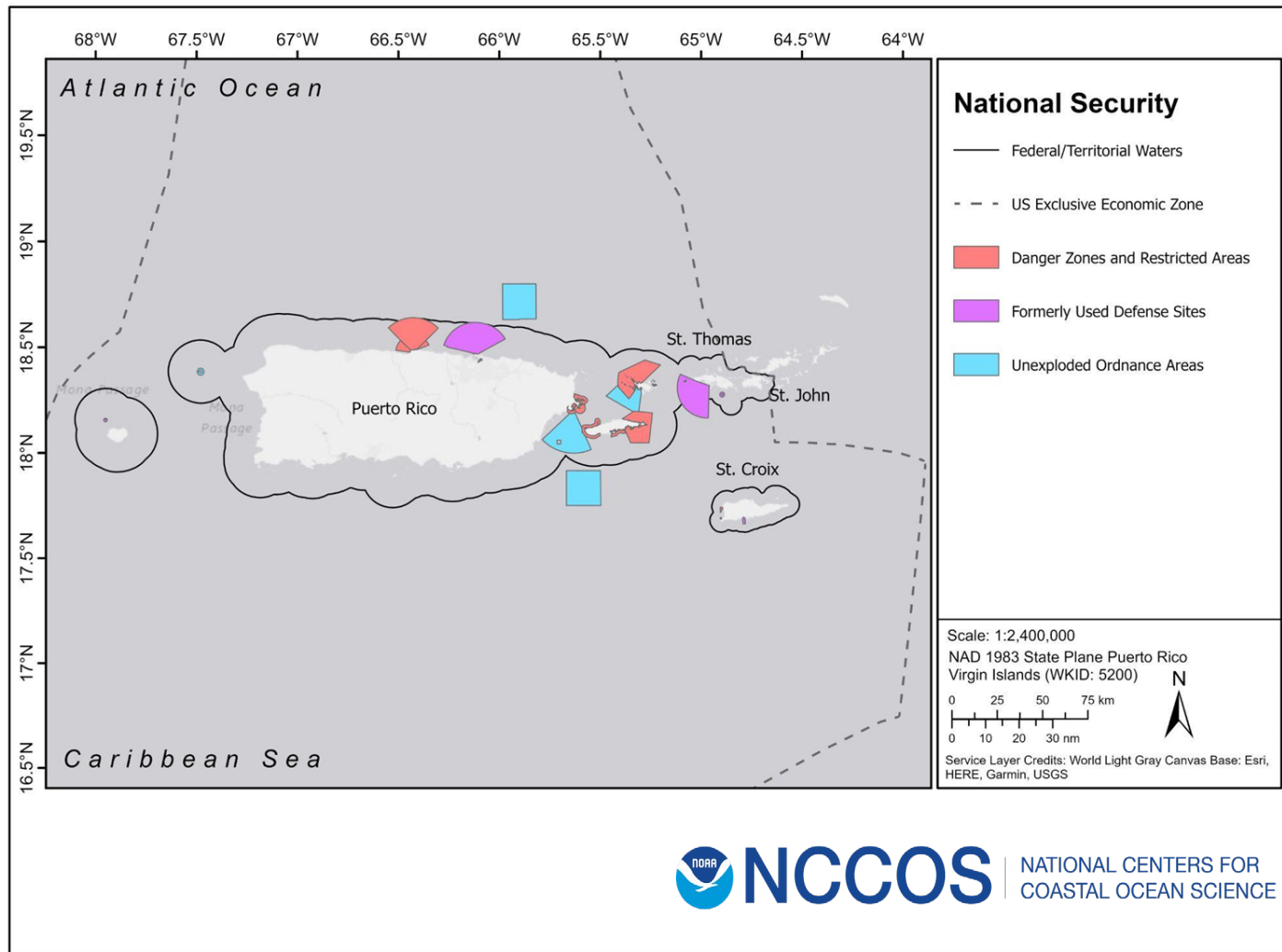
Original Source: DOD (USACE)

Industries

Locations of vessel traffic, key industrial concerns (shipping lanes, pipelines, submarine cables), buoys and weather forecasting devices

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noaa

Industries - Summary Data List

- ➤ Aids To Navigation
- ➤ AIS Vessel Tracks
- ➤ Anchorage Areas
- ➤ Buoys and HF Radar Stations
- ➤ Fish Aggregating Devices (FADs)
- ➤ Maintained Channels
- ➤ NEXRAD Site

- ➤ Ocean Disposal Sites
- ➤ Pilot Boarding Areas
- ➤ Pipeline Areas
- ➤ Ports and Harbors
- ➤ Submarine Cables
- ➤ Wrecks and Obstructions

Aids To Navigation

Summary: aids to navigation (e.g., lights, signals, buoys, and day beacons), that are intended to assist a navigator to determine position or safe course, or to warn of dangers or obstructions to navigation. The U.S. Coast Guard is responsible for ensuring that this network is up to date and functioning properly so recreational and commercial boaters can safely navigate the maritime environment.

Type: Point

Original Source: US Coast Guard

Data Link / Metadata Link

Industries

— Federal/Territorial Waters

--- US Exclusive Economic Zone

• Aids To Navigation

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
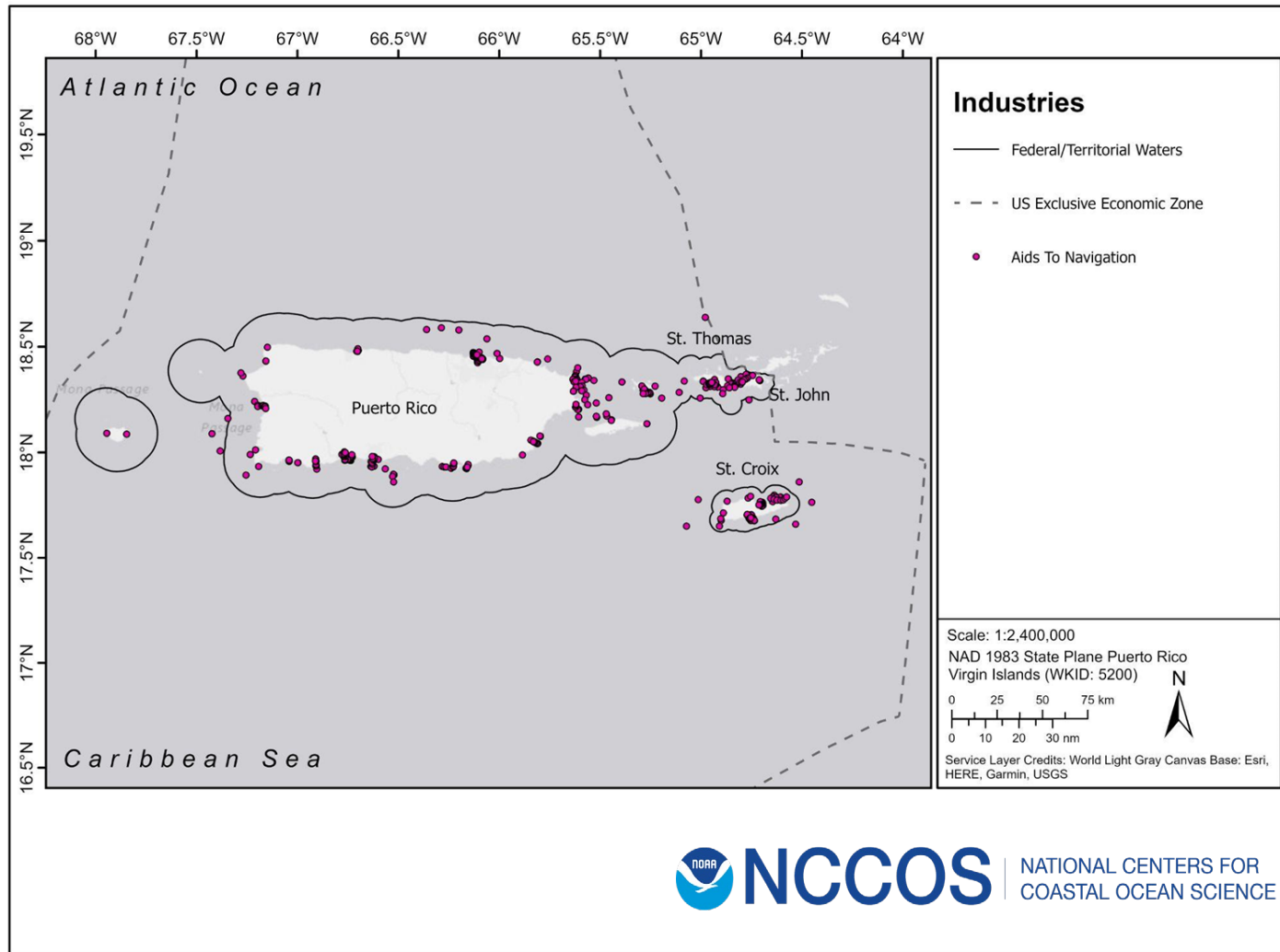
AIS Vessel Tracks 2022

Summary: the location and characteristics of commercial and recreational boats as a sequence of positions transmitted by an Automatic Identification System (AIS). The distribution, type, and frequency of vessel tracks are a useful aid to understanding the risk of conflicting uses within a certain geographic area.
Types = Cargo, Fishing, Other, Passenger, Pleasure and Sailing, Tanker, Tug and Tow

Type: Line

Original Source: US Coast Guard

Data Link / Metadata Link

Industries

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

— AIS Vessel Tracks 2022

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
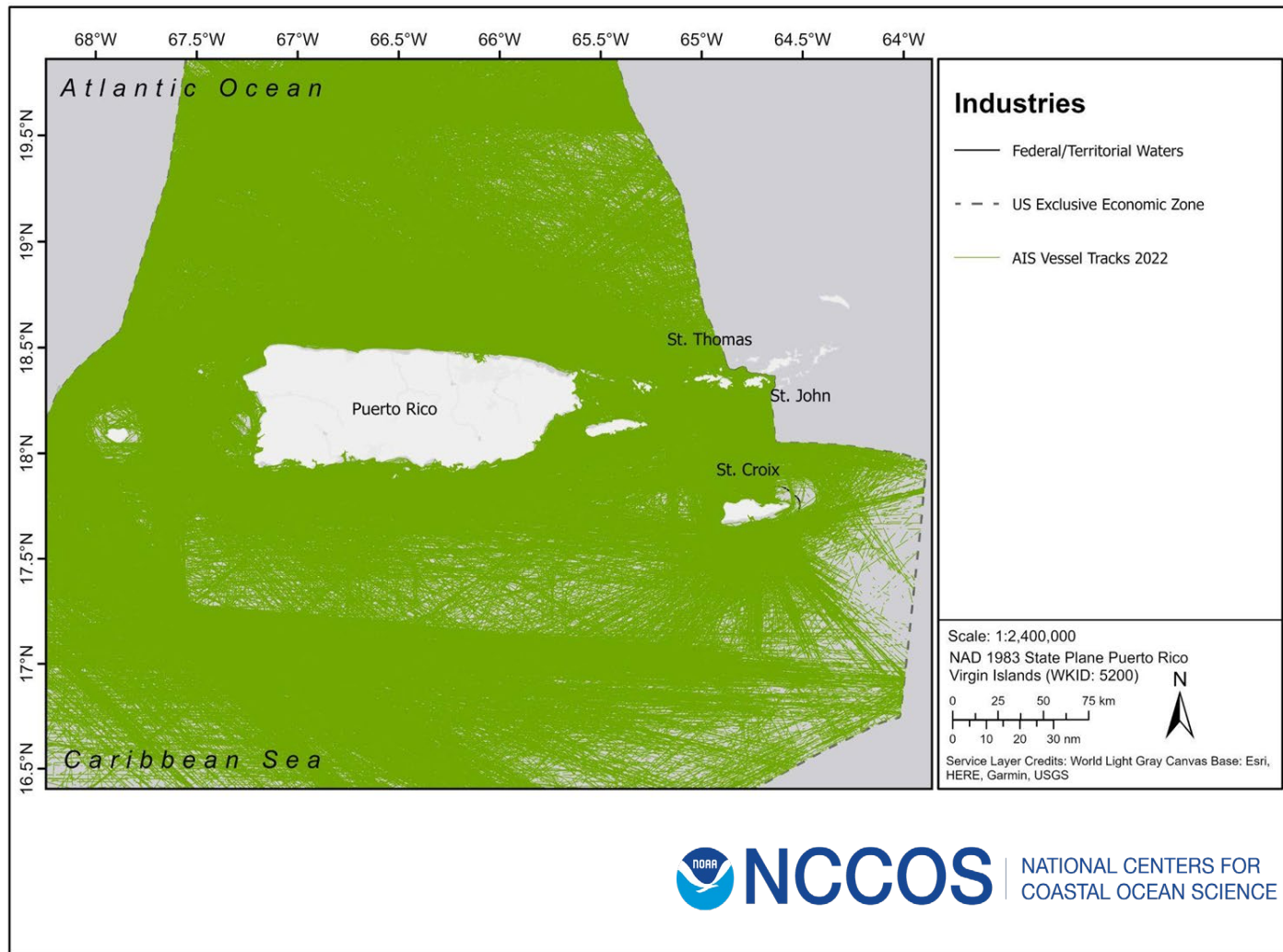
Anchorage Areas

Summary: well defined navigable waters where a vessel may safely drop anchor. The size, shape, and conditions for use can vary widely among different anchorages. Generally anchorages are not used for an indefinite duration, nor are they routinely used for maintenance, repair, overhaul, bunkering, or sea trials.

Type: Polygon

Original Source: US Government Publishing Office, NOAA Office of Coast Survey

Data Link

Industries

— Federal/Territorial Waters

--- US Exclusive Economic Zone

☐ Anchorage Areas

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
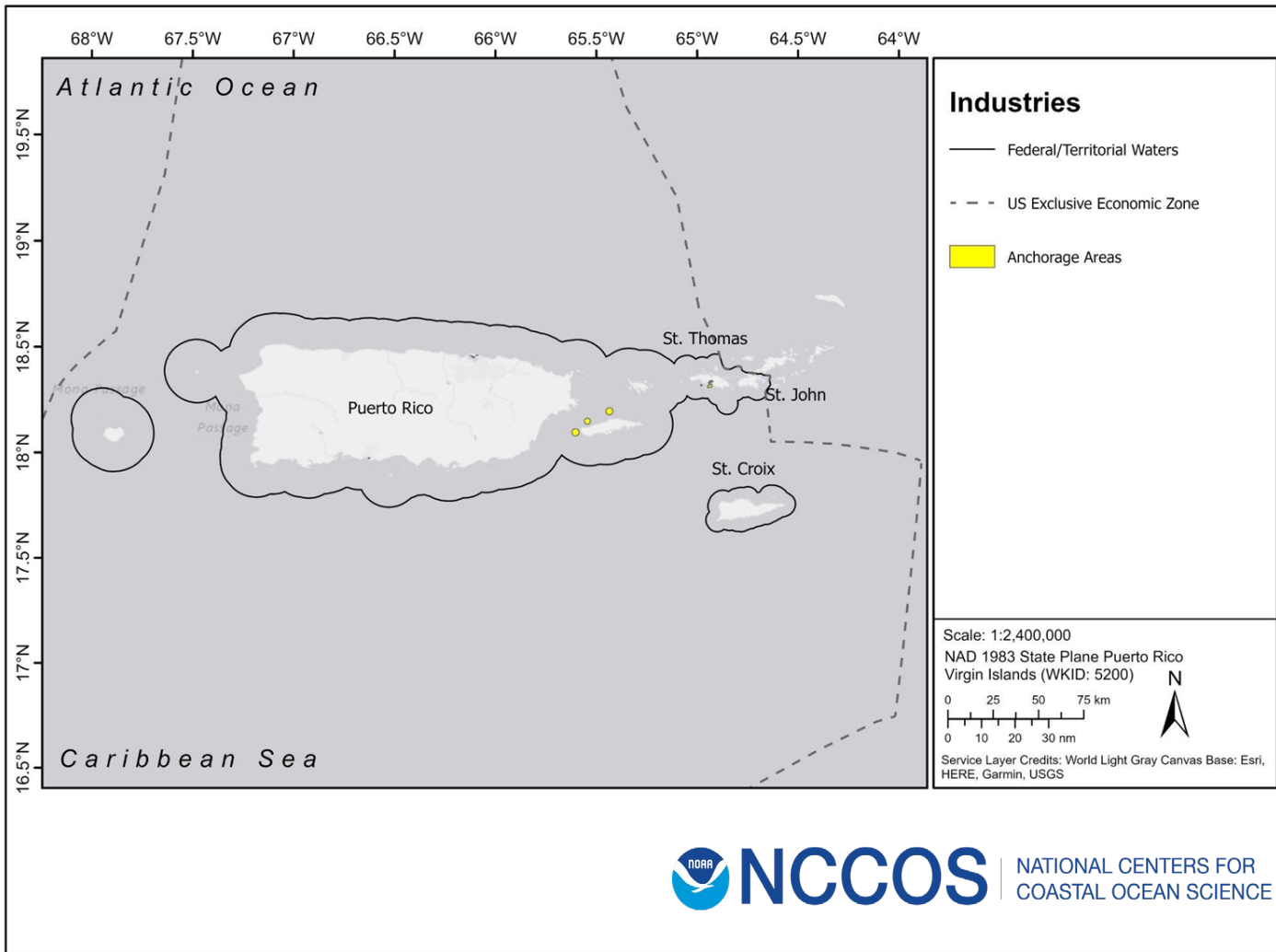
Buoys and HF Radar Stations

Buoys (NDBC): location of buoy stations in the US Caribbean.

Data Link

HF Radar Stations: HF Radar Network (HFRNet) is developed to manage and distribute in near-real time ocean surface currents measured by a distributed network of shore-based HF radar systems.

Data Link

Type: Point

Original Source: National Data Buoy Center, IOOS / UC San Diego

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
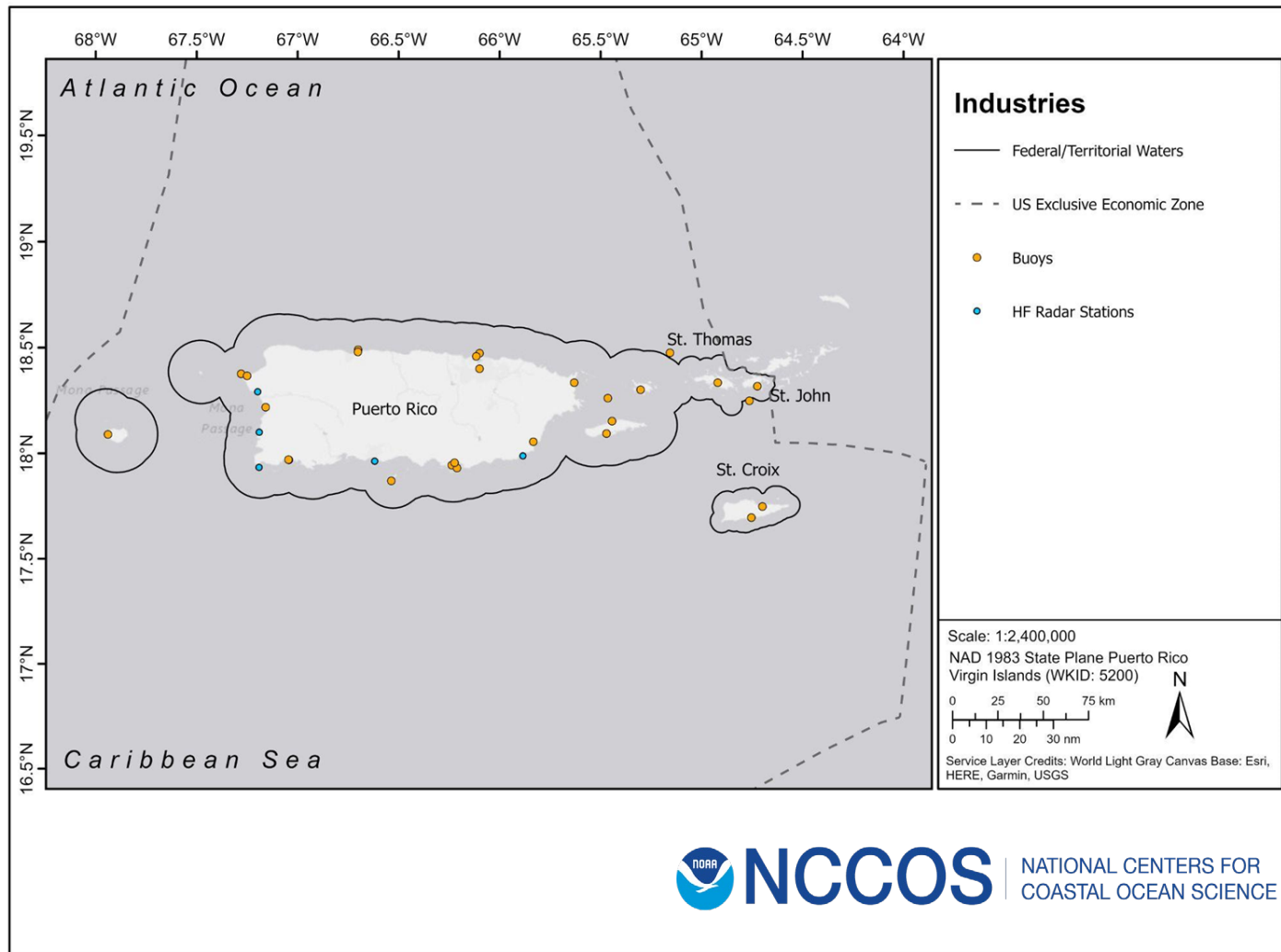
Fish Aggregating Devices (FADs)

Summary: the location of surface and submerged fish aggregating devices (FADs) along the north coast of Puerto Rico and the USVI.

Type: Point

Original Source (PR): Puerto Rico FAD Sistema

Data Link
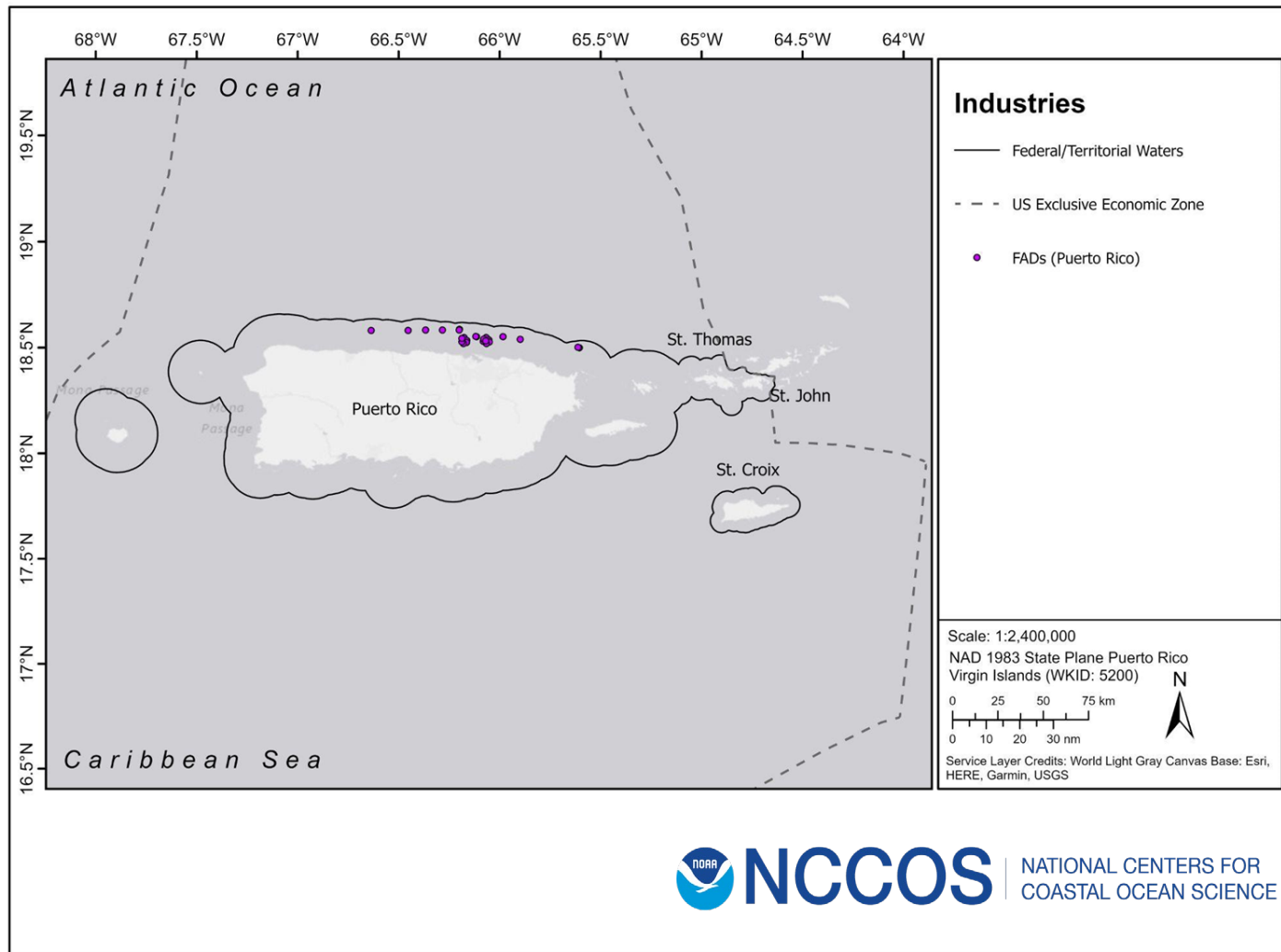
Maintained Channels

Summary: coastal channels and waterways that are maintained and surveyed by the U.S. Army Corps of Engineers. These channels are necessary transportation systems that serve economic and national security interests.

Type: Polygon

Original Source: DOD (USACE), NOAA Office of Coast Survey

Navigation
Data Link / Metadata Link

Coastal
Data Link / Metadata Link
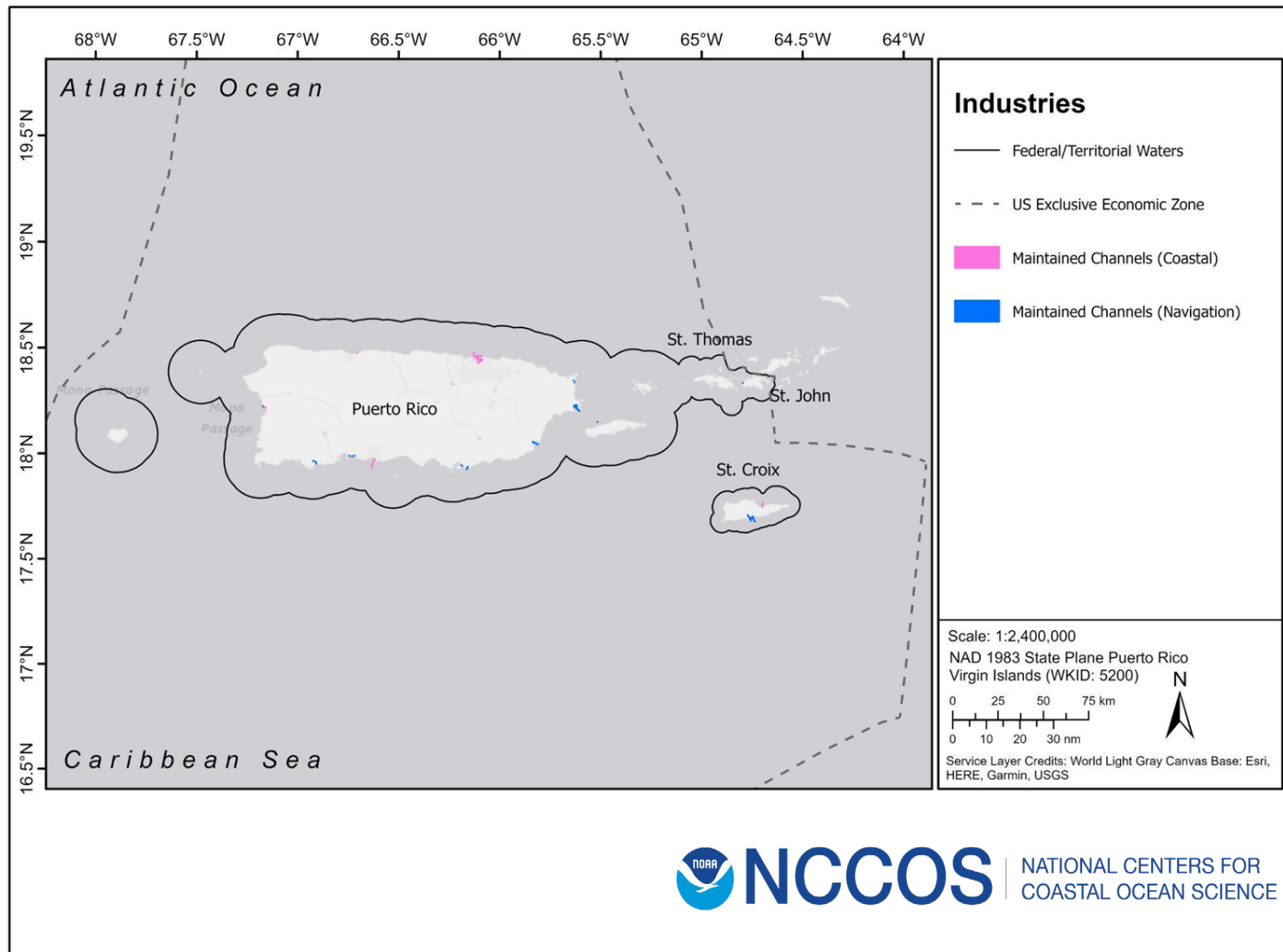
NEXRAD Site

Summary: Next Generation Weather Radar is a network of high-resolution weather radars operated by the National Weather Service (NWS) that detects precipitation and atmospheric movement or wind. NWS recommended for siting wind energy that areas <35 km from sites should be completely avoided, and areas 35 to 70 km may have potential interactions.

Type: Point

Original Source: NOAA NWS

Data Link
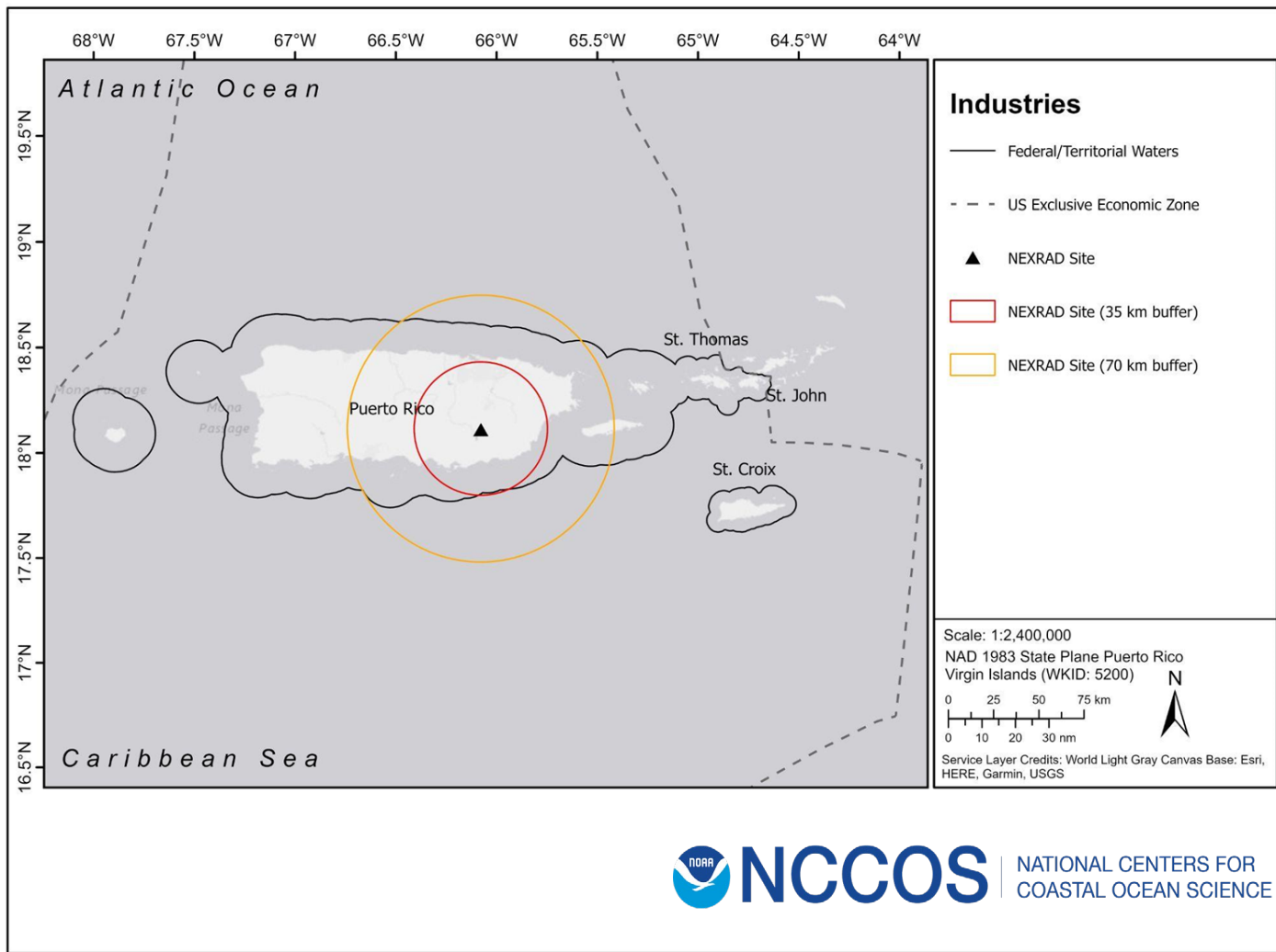
Ocean Disposal Sites & Pilot Boarding Areas

Ocean Disposal Sites: location of available and discontinued ocean disposal sites within U.S. waters. Contemporary ocean disposal sites generally accept clean dredged material (sediment) collected during navigation channel improvement projects.

Data Link / Metadata Link

Pilot Boarding Areas: A location offshore where a pilot may board a vessel in preparation to piloting it through local waters. Pilot boarding stations and areas are either a well-defined position, a circular area around a position, or another more complex shaped area with well-defined boundaries.

Data Link / Metadata Link

Type: Polygon

Original Source: DOD (USACE) NOAA Office of Coast Survey

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
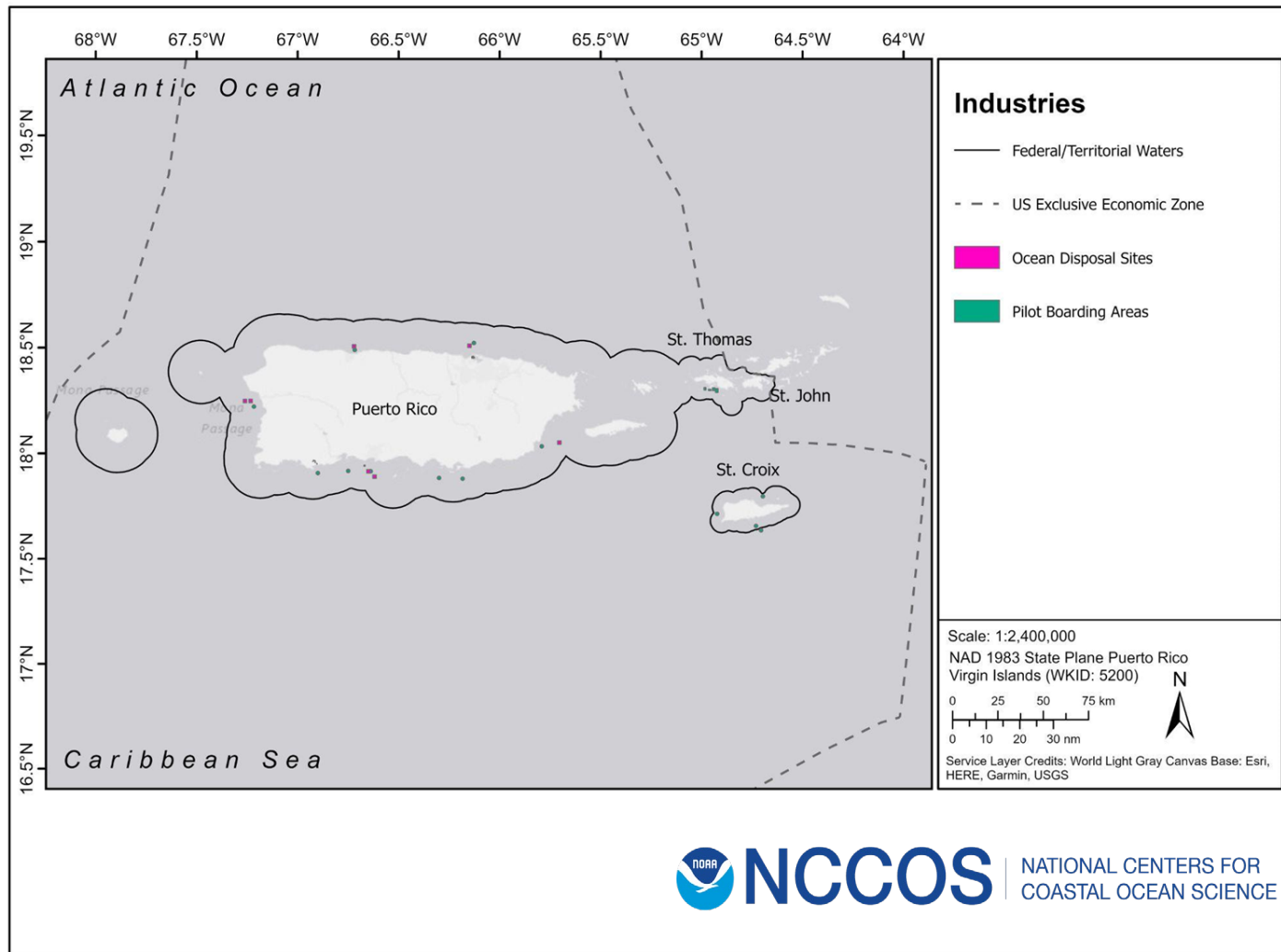
Pipeline Areas

Summary: general location of pipelines within U.S. waters. The geographic footprint for each pipeline may vary and is dependent on the original source data. In the nearshore, pipelines are routinely buried below the seabed. In the offshore, they are placed directly on the seabed. A pipeline area may contain one or more physical pipelines.

Type: Polygon

Original Source: DOD

Data Link / Metadata Link
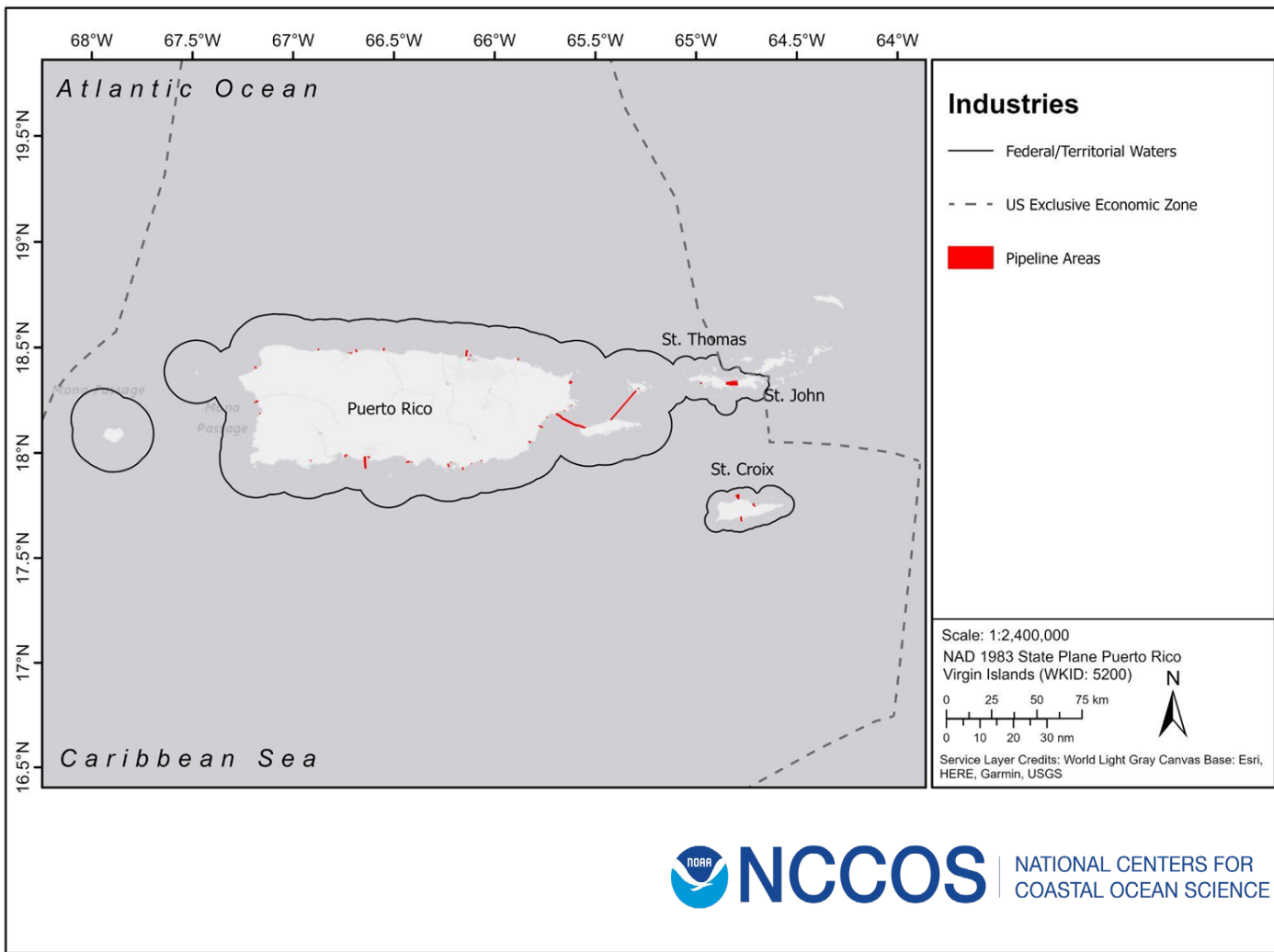
Industries

— Federal/Territorial Waters

--- US Exclusive Economic Zone

▬ Pipeline Areas

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Atlantic Ocean

Caribbean Sea

Puerto Rico

St. Thomas
St. John
St. Croix

Mona Passage

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Ports and Harbors

Summary: compilation of publicly accessible seaport information for ports and harbors in Puerto Rico and the US Virgin Islands.

Type: Point

Original Source: World Port Source

Data Link
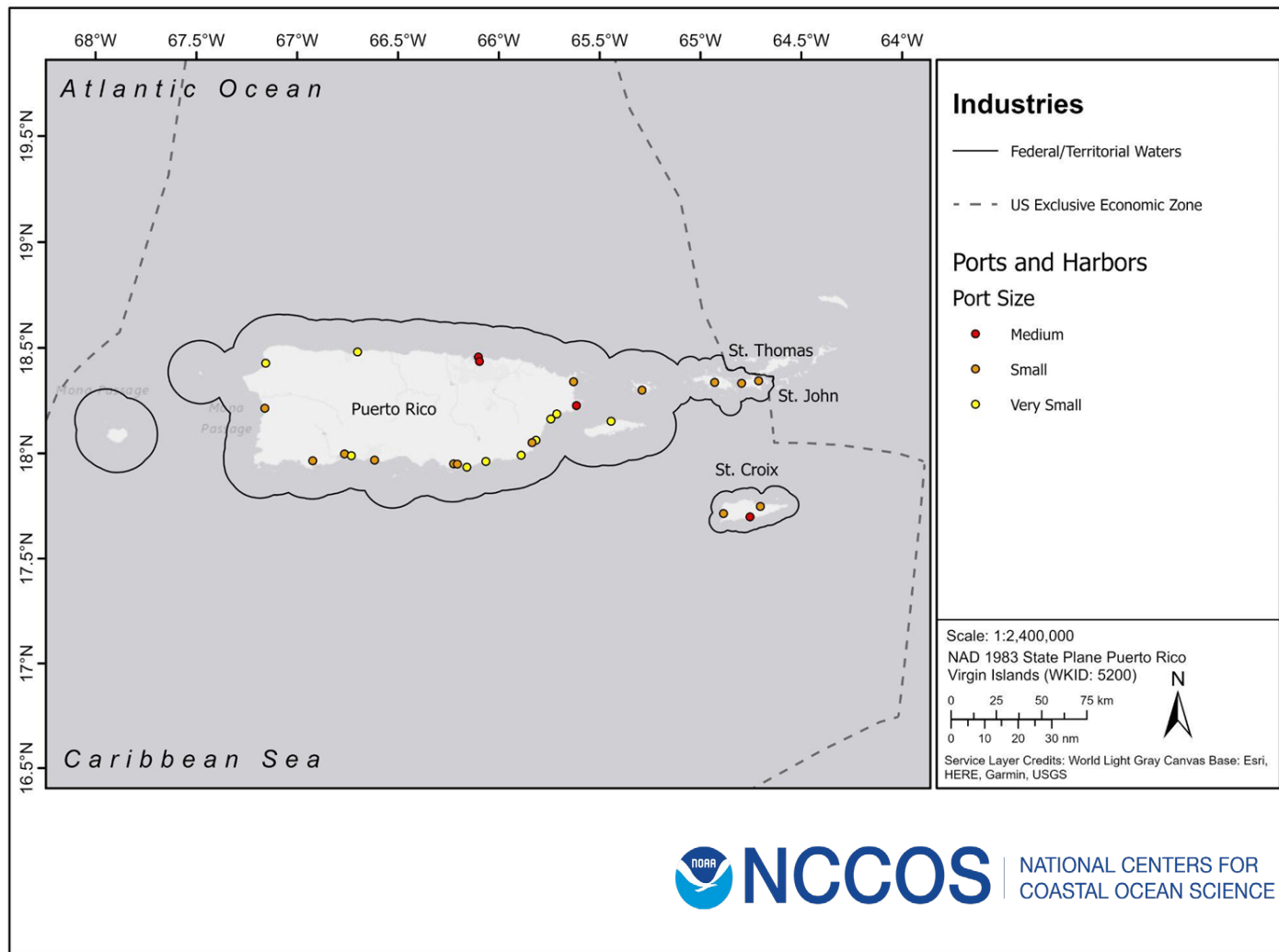
Submarine Cables & Areas

Summary: general location of commercial and research submarine cables in and around U.S. navigable waters. The majority of these cables are for telecommunications, and the remaining are for power transmission. In the nearshore, cables are routinely buried below the seabed. In the offshore, they are placed directly on the seabed.

Type: Line / Polygon

Original Source: NOAA Office of Coastal Survey, NASCA, USACE

Submarine Cables
Data Link

Submarine Cable Areas
Data Link / Metadata Link
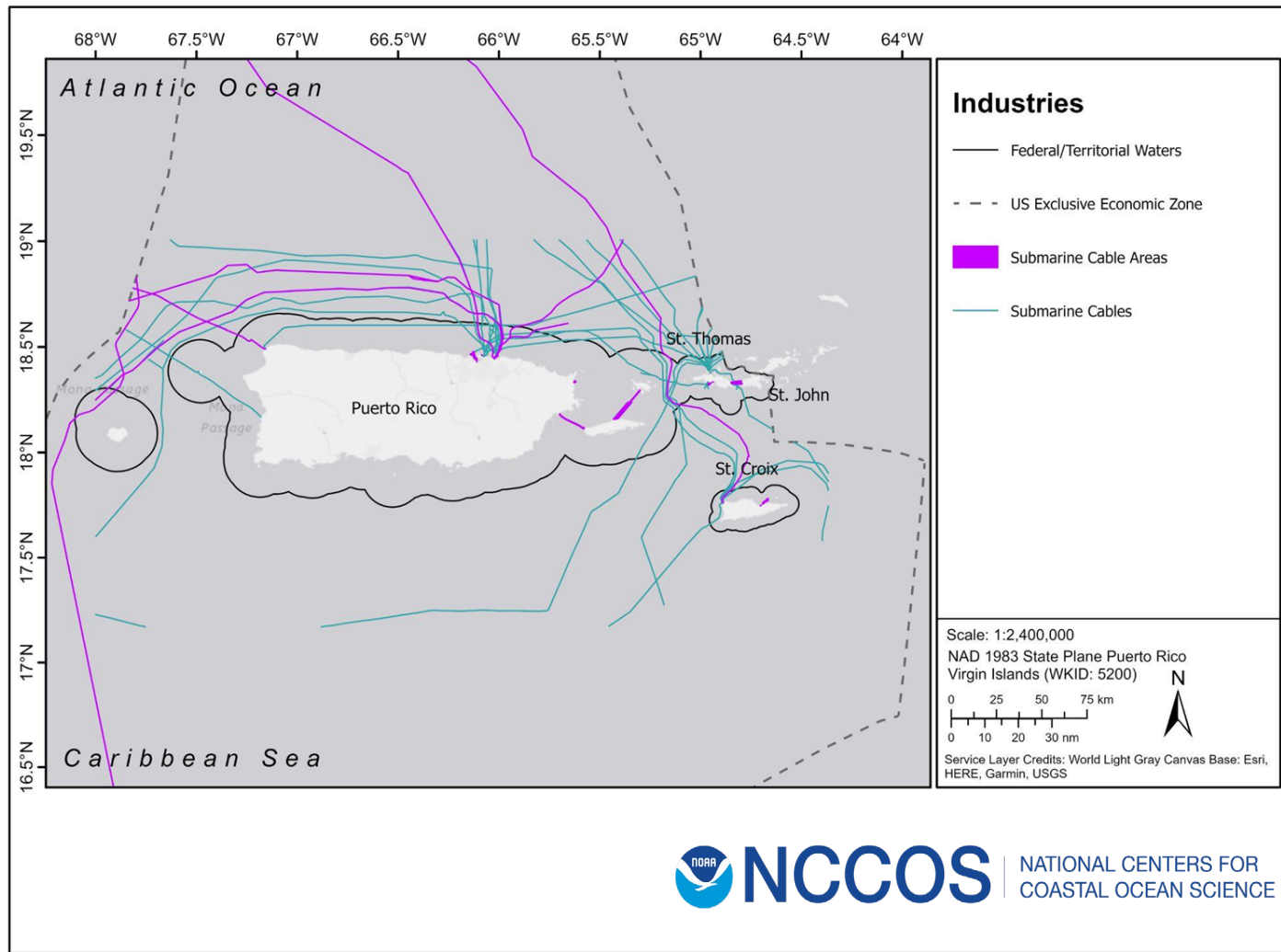
Industries

— Federal/Territorial Waters

--- US Exclusive Economic Zone

■ Submarine Cable Areas

— Submarine Cables

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Wrecks and Obstructions

Summary: The Automated Wreck and Obstruction Information System (AWOIS) and Electronic Navigational Charts (ENC) contain information on over 10,000 submerged wrecks and obstructions in the coastal waters of the United States.

Type: Point

Original Source: NOAA Office of Coast Survey

Data Link
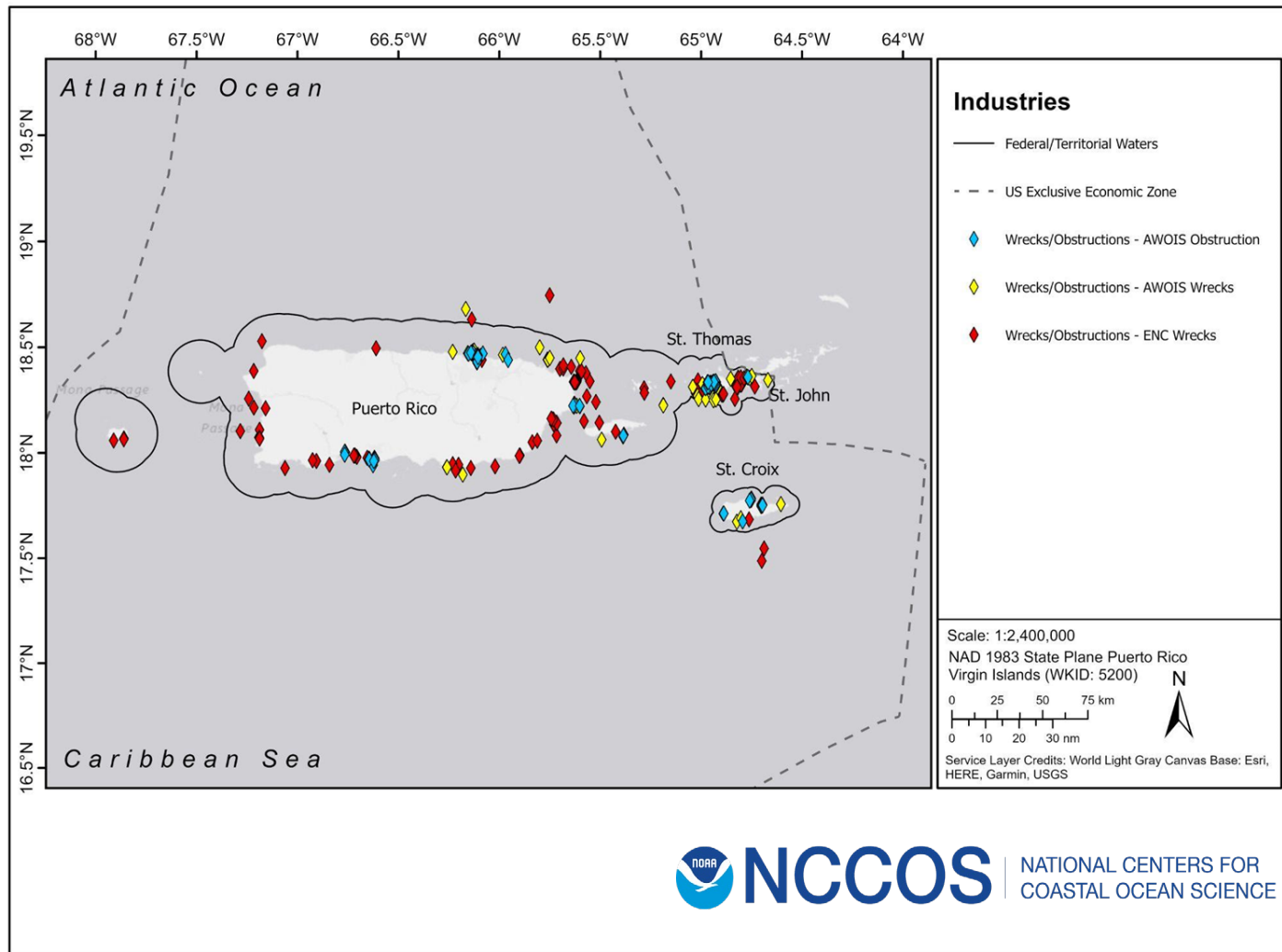
Fisheries

Areas where both commercial and recreational fisheries are active

National Centers for Coastal and Ocean Science
National Marine Fisheries Service

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Recreational Fisheries

Recreational data through NOAA SEFSC
- Has not collected data since 2017

Fishing Tournaments
- Recreational tournaments might have some spatial data (catch & release)

Dolphinfish Research Program
- Some satellite tagging data

Fish Aggregating Devices (FADs)
- Puerto Rico FAD Sistema
- USVI DPNR - no FADs in territory

Photo Credit: Puerto Rico FAD Sistema
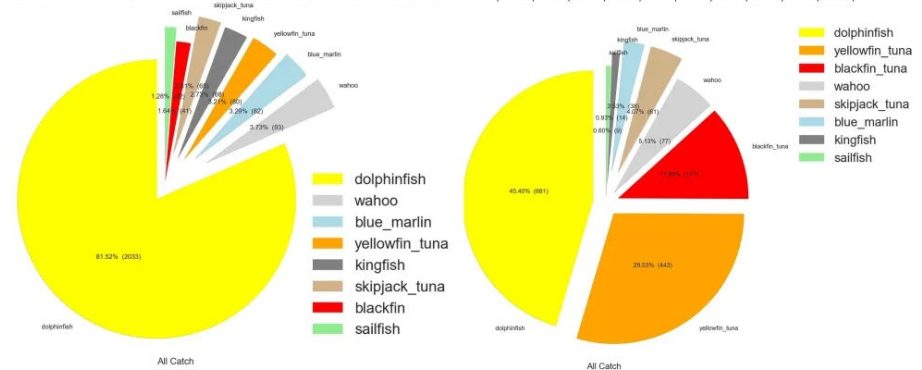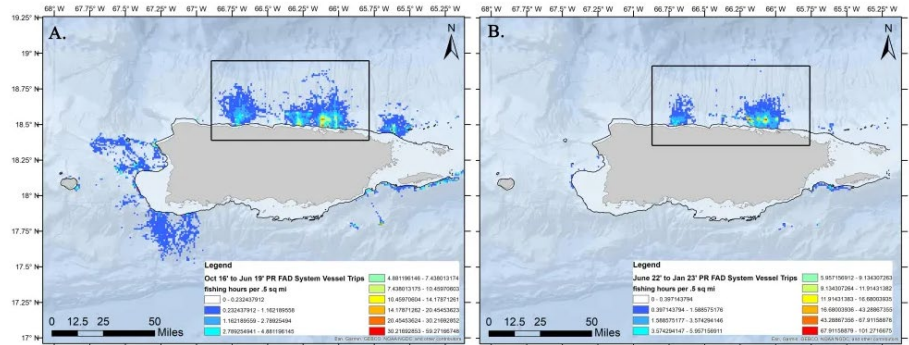
Commercial Fisheries

Commercial Landings (CCL)
- All forms request spatial distribution of catch (area fished)
  - Since July 2011 for USVI and January 2012 for PR
  - Landings Data
  - Data are up to date through 2020/2021

- Limitations with reporting
  - Less than 40% of the reports contain spatial information
  - Delay between reporting and forms sent to the science center
  - Large areas for providing spatial information (low resolution)

- Port Sampling
  - Valuable metrics including fishing area and effort

Photo Credit: Caribbean Fishery Management Council
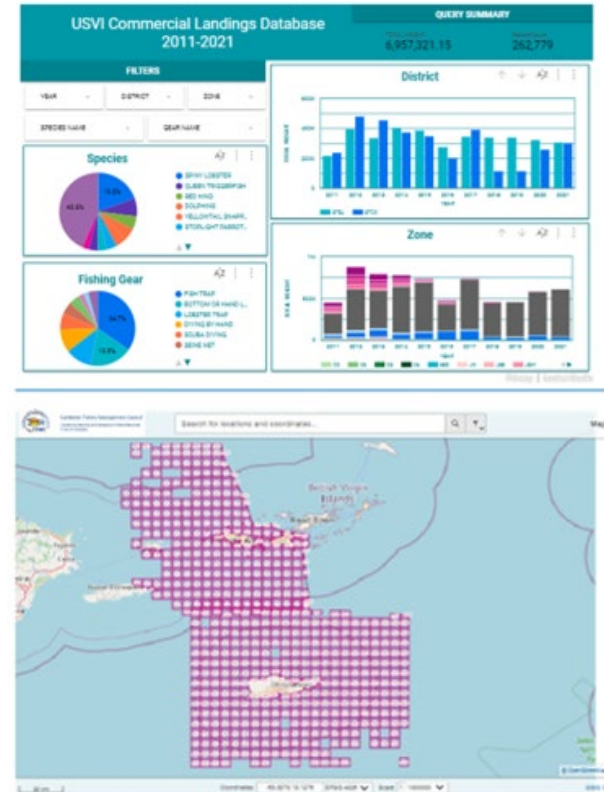
Fisheries-Independent Sampling

SEAMAP: Southeast Area Monitoring and Assessment Program
- Provides efficient and effective data collection of fishery-independent sampling (27-30 years of data)

CRCP: Coral Reef Conservation Program
- The program was established in 2000 by the Coral Reef Conservation Act to protect, conserve, and restore the nation's coral reefs by maintaining healthy ecosystem function.
  - Beyond 30 m (mesophotic reef spatial data associated with MPAs and spawning aggregations)
- **NCRMP: National Coral Reef Monitoring Program**
  - Spatial specific information for both habitat and fish communities

Natural Resources

Information about protected species and sensitive habitats

National Centers for Coastal and Ocean Science
National Marine Fisheries Service

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Natural Resources - Data List

- ➢ Coastal Barrier Resource Areas
- ➢ Coastal Critical Habitat Designations
- ➢ Critical Habitat: Sea Turtles
  - ○ Green, Hawksbill, Leatherback
- ➢ Critical Habitat: Corals
  - ○ Elkhorn, Staghorn, Boulder Star, Lobed Star, Mountainous Star, Pillar, Rough Cactus
- ➢ Essential Fish Habitat (EFH)
  - ○ Corals, reef fish, spiny lobster, queen conch
- ➢ EFH - Atlantic Highly Migratory Species
  - ○ Bigeye tuna, yellowfin tuna, swordfish, blue marlin, longbill spearfish, sailfish, white marlin, blacktip shark, Caribbean reef shark, lemon shark, nurse shark, oceanic whitetip shark, tiger shark

- ➢ Fishery Management Areas
  - ○ Bajo de Sico, Grammanik Bank, Hind Bank MCD, Mutton Snapper Spawning Aggreg., Red Hind Spawning Aggreg., Red Hind Closure, Queen Conch
- ➢ Habitat Areas of Particular Concern
- ➢ Protected Areas + PR Protected Natural Areas
- ➢ Benthic Habitat - NOAA (+ specific PR)
- ➢ Benthic Habitat - TNC
- ➢ Shallow Corals
- ➢ *Acropora* Presence/Absence Locations
- ➢ Deep Sea Coral and Sponge Observations
- ➢ Seagrasses
- ➢ Bird Observations

Coastal Barrier Resource Areas

Summary: The Coastal Barrier Resources Act (CBRA) of 1982 and subsequent amendments established the John H. Chafee Coastal Barrier Resources System (CBRS). The CBRS consists of relatively undeveloped coastal barriers and other areas located the Atlantic, Gulf of Mexico, Great Lakes, U.S. Virgin Islands, and Puerto Rico coasts.

Type: Polygon

Original Source: USFWS

[Data Link](#)
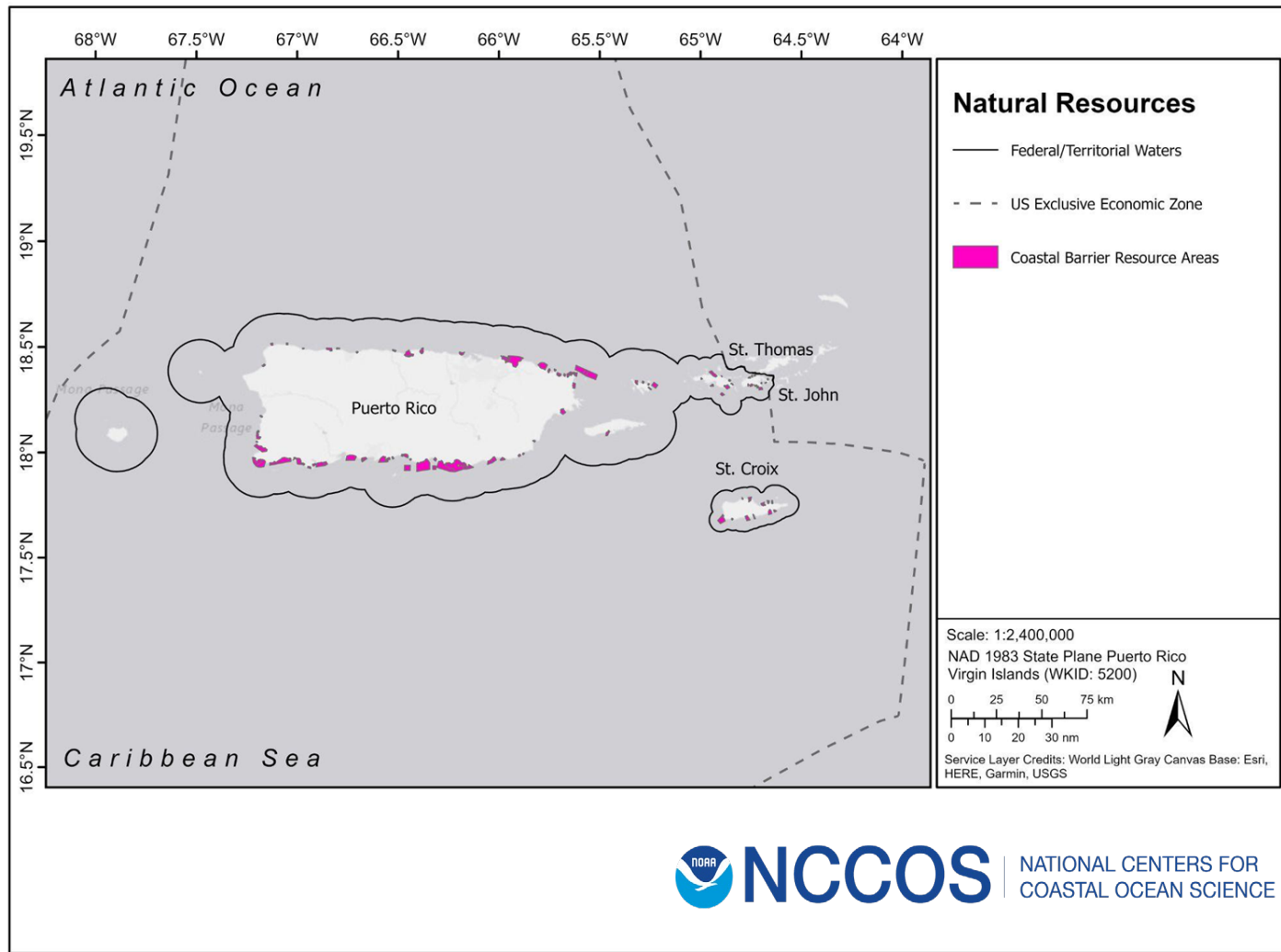
Coastal Critical Habitat Designations

Summary: This dataset is a compilation of the NOAA National Marine Fisheries Service and the U.S. Fish & Wildlife Service designated critical habitat in coastal areas of the United States. Critical habitat is defined as: (1) Specific areas within the geographical area occupied by the species at the time of listing that contain physical or biological features essential to conservation, which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Type: Polygon

Original Source: NOAA NMFS, USFWS, BOEM, NOAA OCM

Data Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

▨ Coastal Critical Habitat Designations

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS
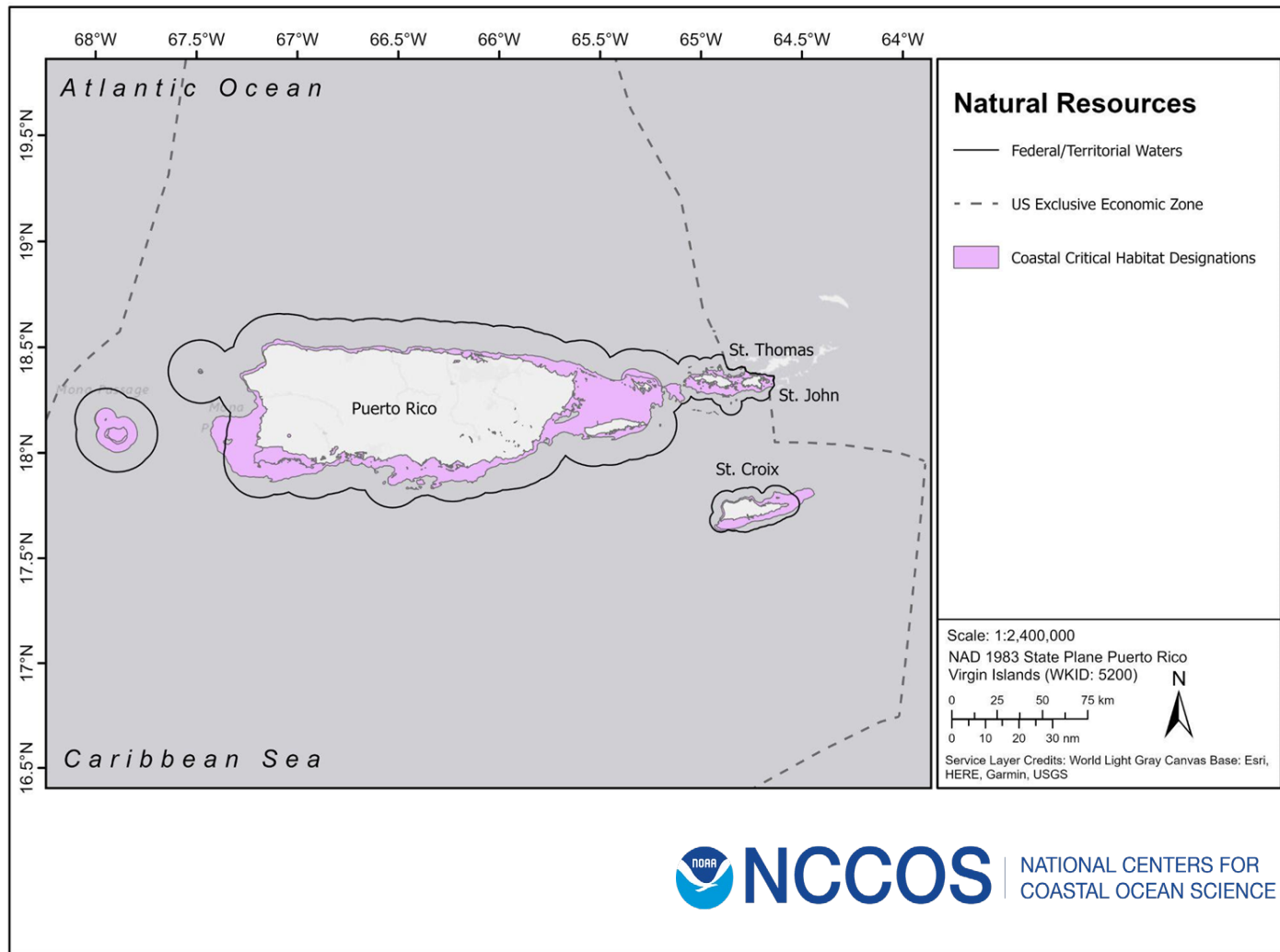
Sea Turtle Critical Habitat

Green Sea Turtle: Critical habitat for the green sea turtle (North Atlantic DPS) as designated by Federal Register Vol. 63, No. 46693, September 2, 1998.

Data Link / Metadata Link

Hawksbill Sea Turtle: Critical habitat for hawksbill turtle as designated by Federal Register Vol. 63, No. 46693, September 2, 1998, Rules and Regulations.

Data Link / Metadata Link

Leatherback Sea Turtle: Critical habitat designated (March 23, 1979, 44 FR 17710) and revised (January 26, 2012, 77 FR 4170) under the Endangered Species Act for the leatherback sea turtle.

Data Link / Metadata Link

Type: Polygon

Original Source: NOAA NMFS

Natural Resources

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

■ Critical Habitat - Green Sea Turtle

■ Critical Habitat - Hawksbill Sea Turtle

■ Critical Habitat - Leatherback Sea Turtle

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

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Acropora: Elkhorn Coral Critical Habitat

Summary: These data represent the critical habitat for elkhorn coral (Acropora palmata) as designated by 73 FR 72210, November 26, 2008, Rules and Regulations.

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

Critical Habitat - Elkhorn Coral

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Atlantic Ocean

Puerto Rico
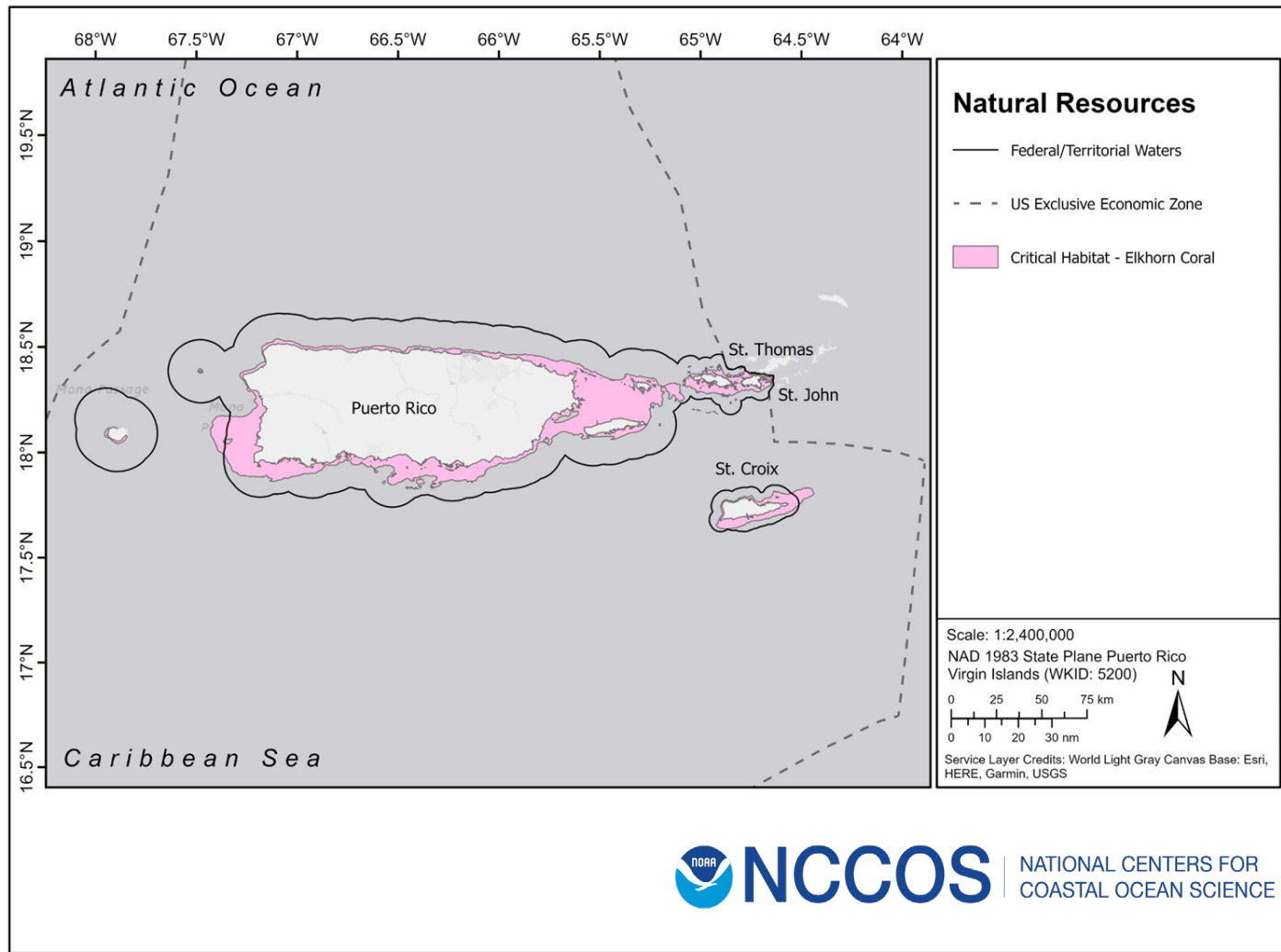
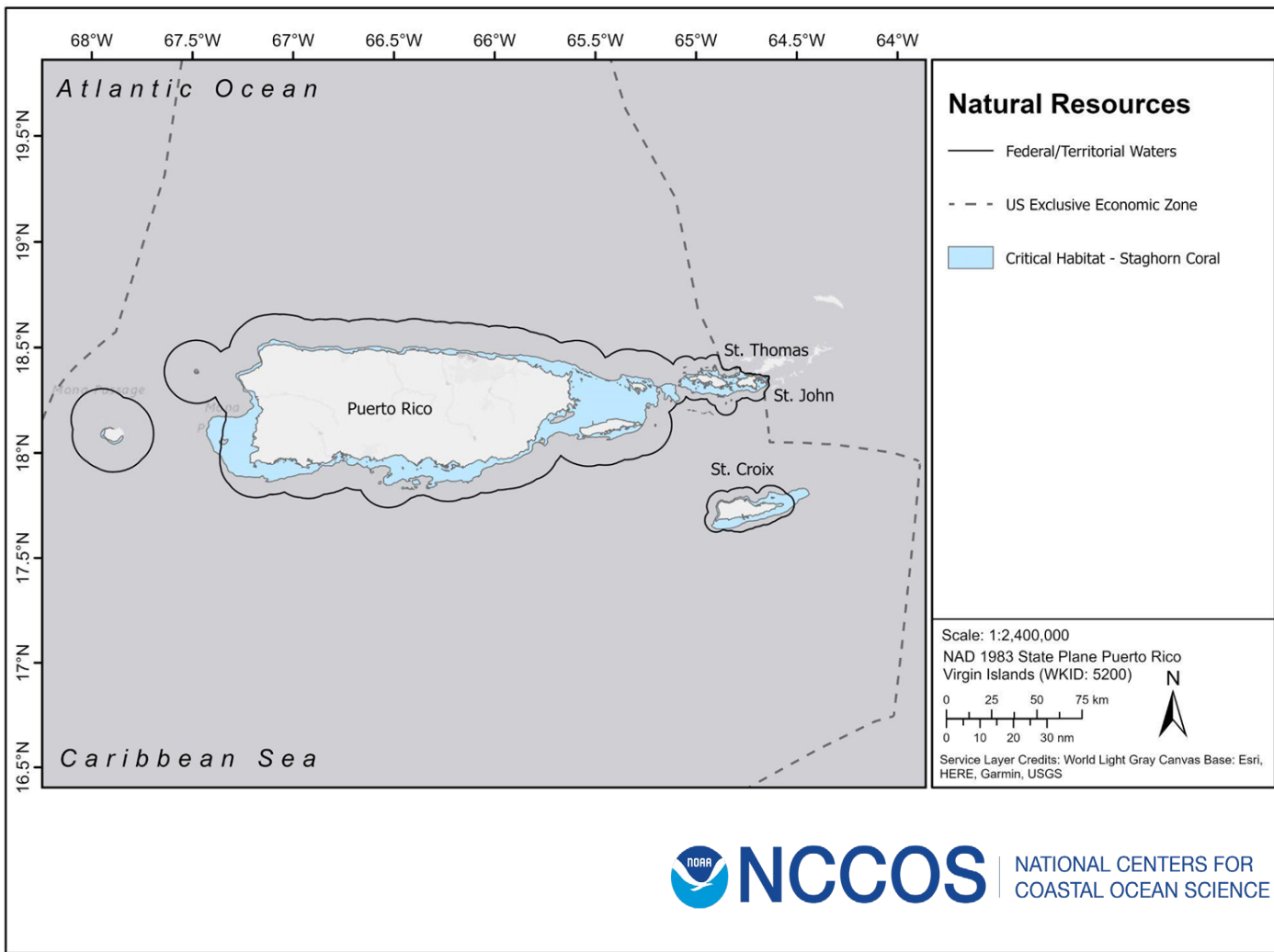St. Thomas
St. John
St. Croix

Caribbean Sea

Acropora: Staghorn Coral Critical Habitat

Summary: These data represent the critical habitat for staghorn coral (Acropora cervicornis) as designated by 73 FR 72210, November 26, 2008, Rules and Regulations.

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Boulder Star Coral: Critical Habitat

Summary: These data represent the critical habitat designation (August 9, 2023) under the Endangered Species Act for the boulder star coral.

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Natural Resources

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

▨ Critical Habitat - Boulder Star Coral

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

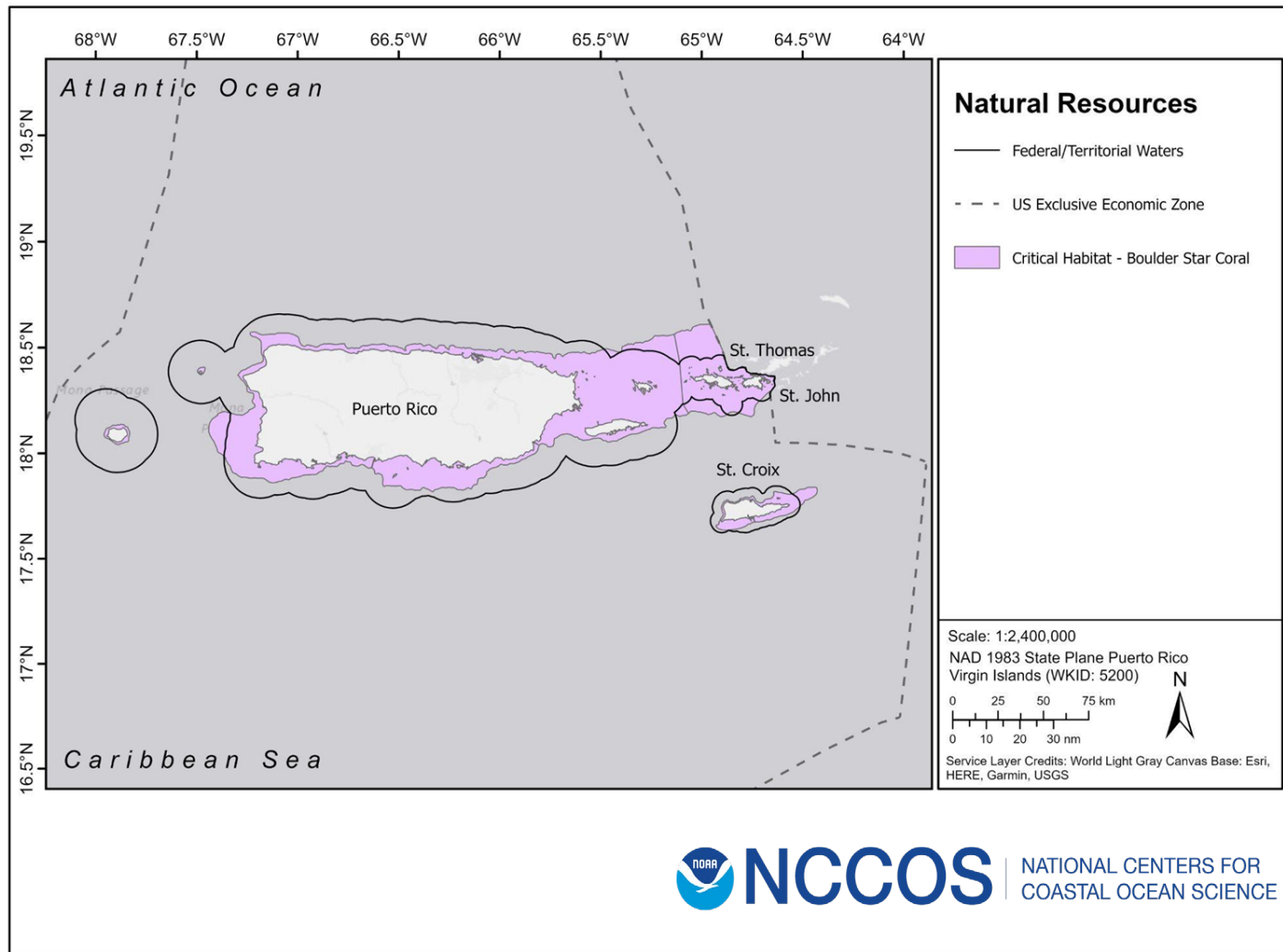**NCCOS** | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Lobed Star Coral: Critical Habitat

Summary: These data represent the critical habitat designation (August 9, 2023) under the Endangered Species Act for the lobed star coral (Orbicella annularis).

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Natural Resources

—— Federal/Territorial Waters

- - - US Exclusive Economic Zone

▢ Critical Habitat - Lobed Star Coral

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

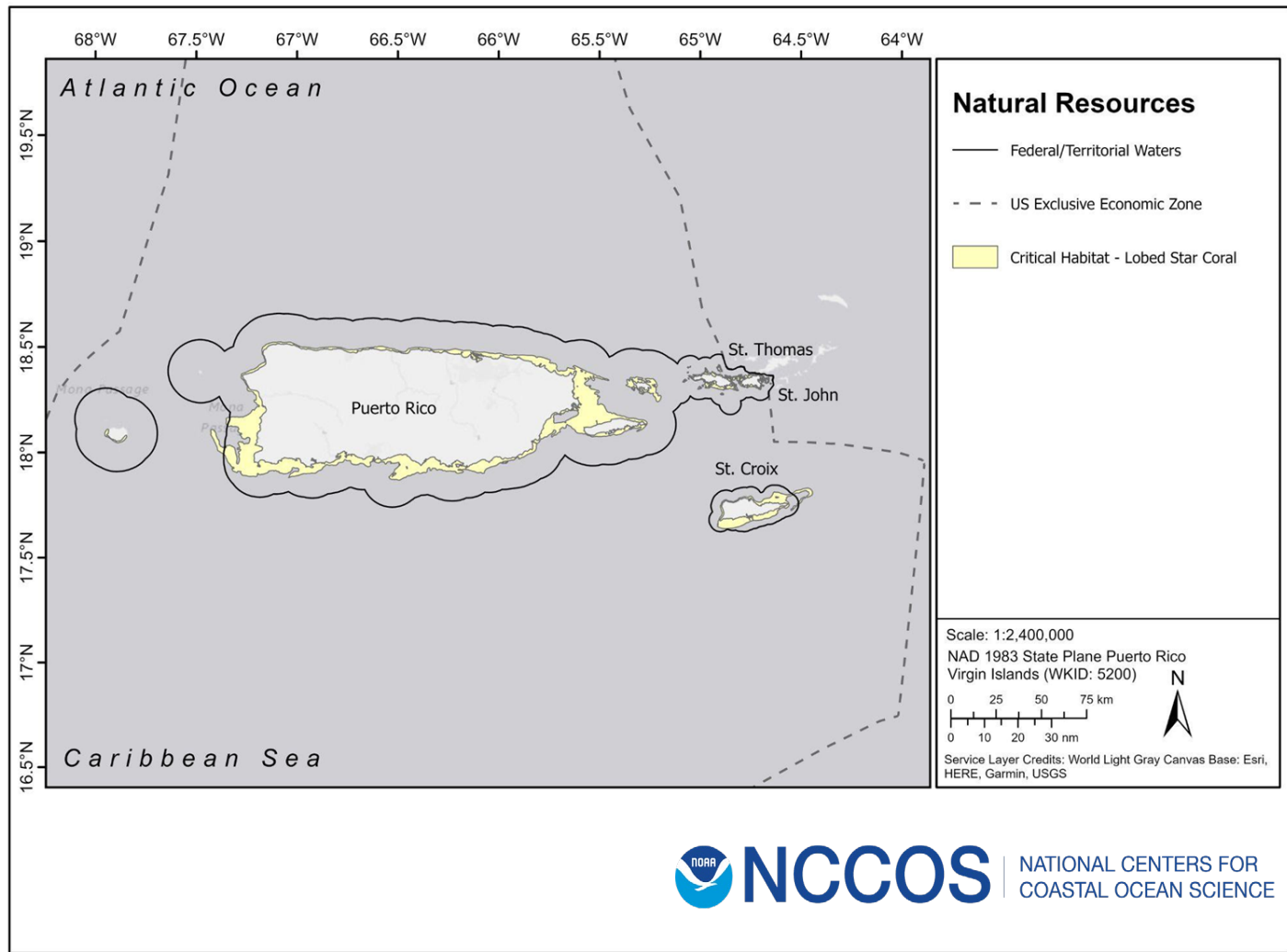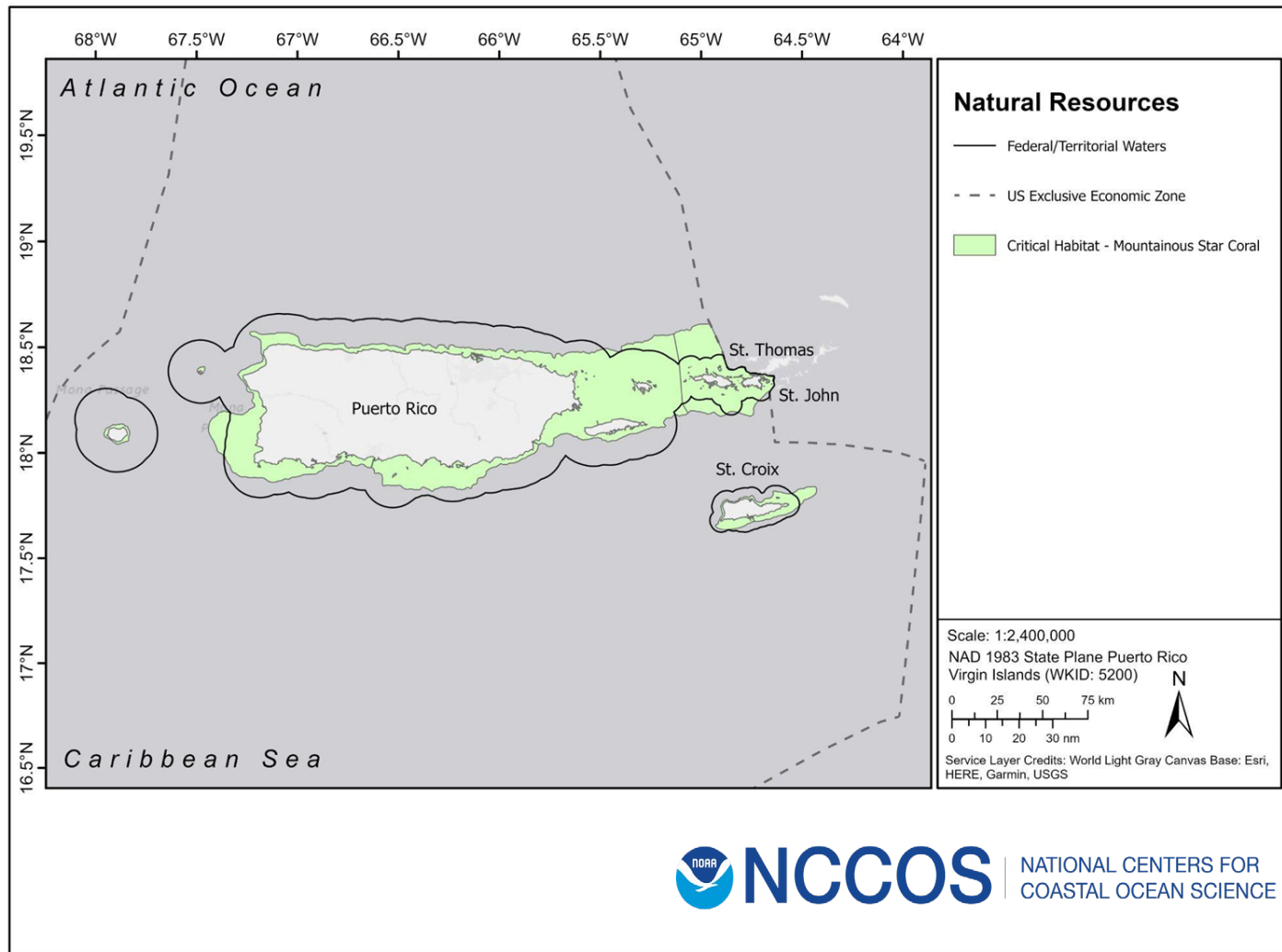Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Mountainous Star Coral: Critical Habitat

Summary: These data represent the critical habitat designation (August 9, 2023 under the Endangered Species Act for the mountainous star coral (Orbicella faveolata).

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Pillar Coral: Critical Habitat

Summary: These data represent the critical habitat designation (August 9, 2023) under the Endangered Species Act for the pillar coral (Dendrogyra cylindrus).

Type: Polygon

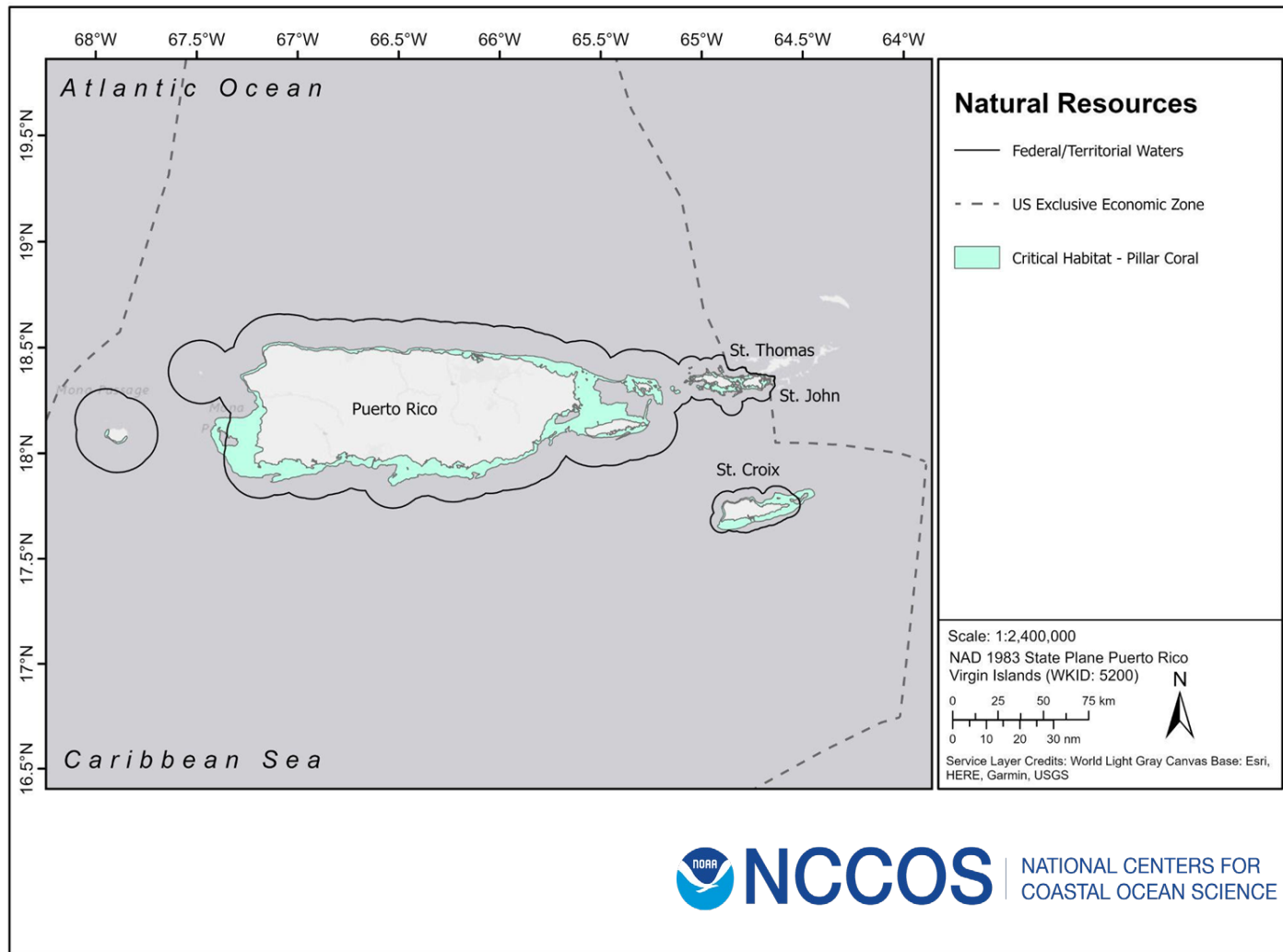**Original Source:** NOAA NMFS

Data Link / Metadata Link

Rough Cactus Coral: Critical Habitat

Summary: These data represent the critical habitat designation (August 9, 2023) under the Endangered Species Act for the rough cactus coral (Mycetophyllia ferox).

Type: Polygon

Original Source: NOAA NMFS

Data Link / Metadata Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

Critical Habitat - Rough Cactus Coral

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS
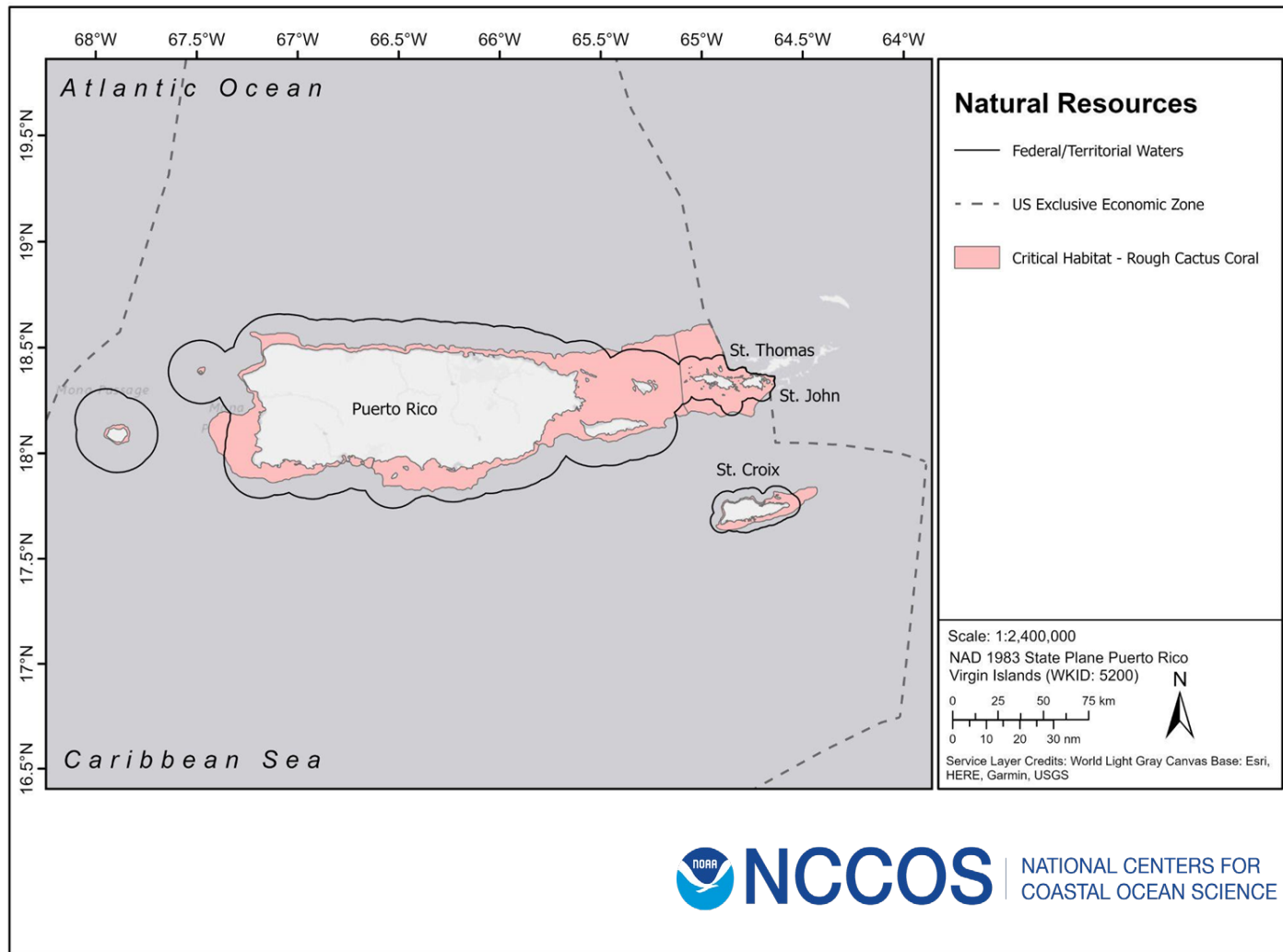
Essential Fish Habitat

Summary: This dataset depicts the boundary of essential fish habitat for managed species in the EFH Mapper. Caribbean Corals and Reef (Innumerable species for data collection purposes only), Reef Fish (Angelfish, Boxfish, Goatfish, Groupers, Grunts, Jacks, Parrotfish, Porgies, Sixty species for aquarium trade only, Snappers, Scups, Squirrelfish, Surgeonfish, Tilefish, Triggerfish and Filefish, Wrasses), Queen Conch, Spiny Lobster

Type: Polygon

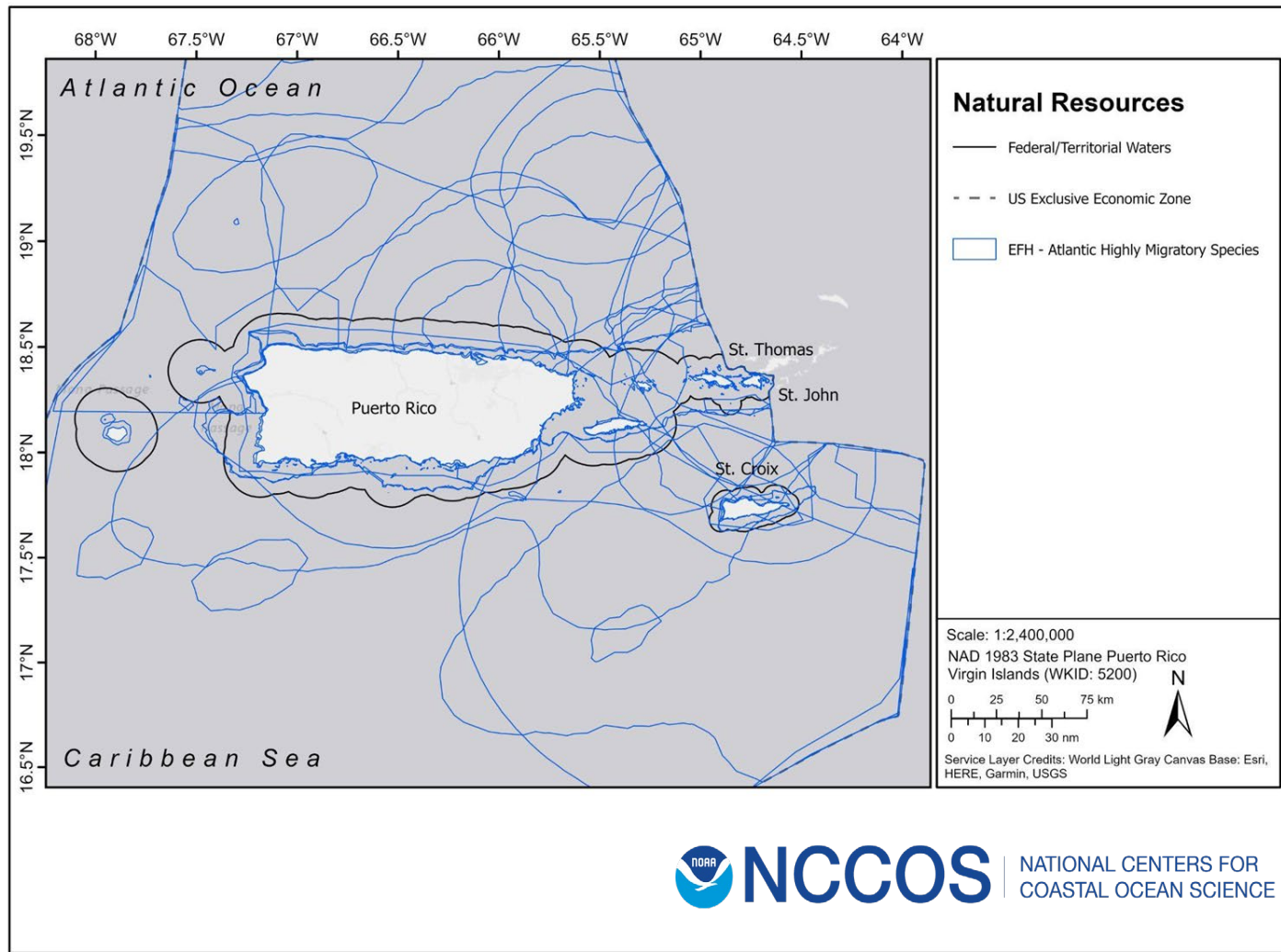**Original Source:** NOAA NMFS / CFMC

Data Link
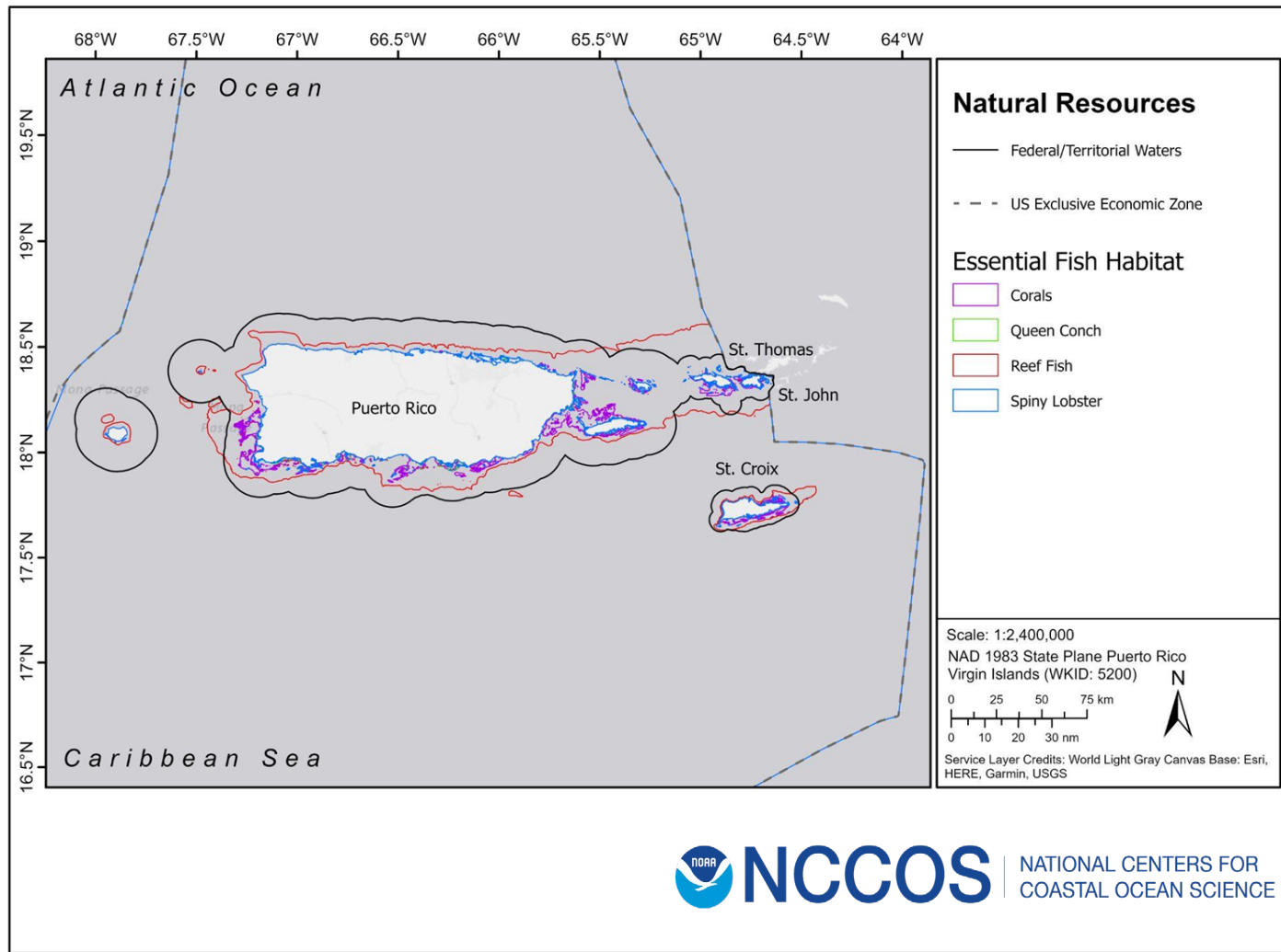
EFH - Atlantic Highly Migratory Species

Summary: This dataset depicts the boundary of essential fish habitat for managed species in the EFH Mapper. Species: Bigeye Tuna, Yellowfin Tuna, Swordfish, Blue Marlin, Longbill Spearfish, Sailfish, White Marlin, Blacktip Shark (Gulf of Mexico Stock), Caribbean Reef Shark, Lemon Shark, Nurse Shark, Oceanic Whitetip Shark, Tiger Shark.

Type: Polygon

Original Source: NOAA NMFS / CFMC

Data Link

Natural Resources

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

☐ EFH - Atlantic Highly Migratory Species

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km

0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

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Fishery Management Areas

Bajo de Sico Reef Fish
Data Link

Grammanik Bank Reef Fish
Data Link

Hind Bank MCD Reef Fish
Data Link

**Mutton Snapper Spawning
Aggregation Reef Fish**
Data Link

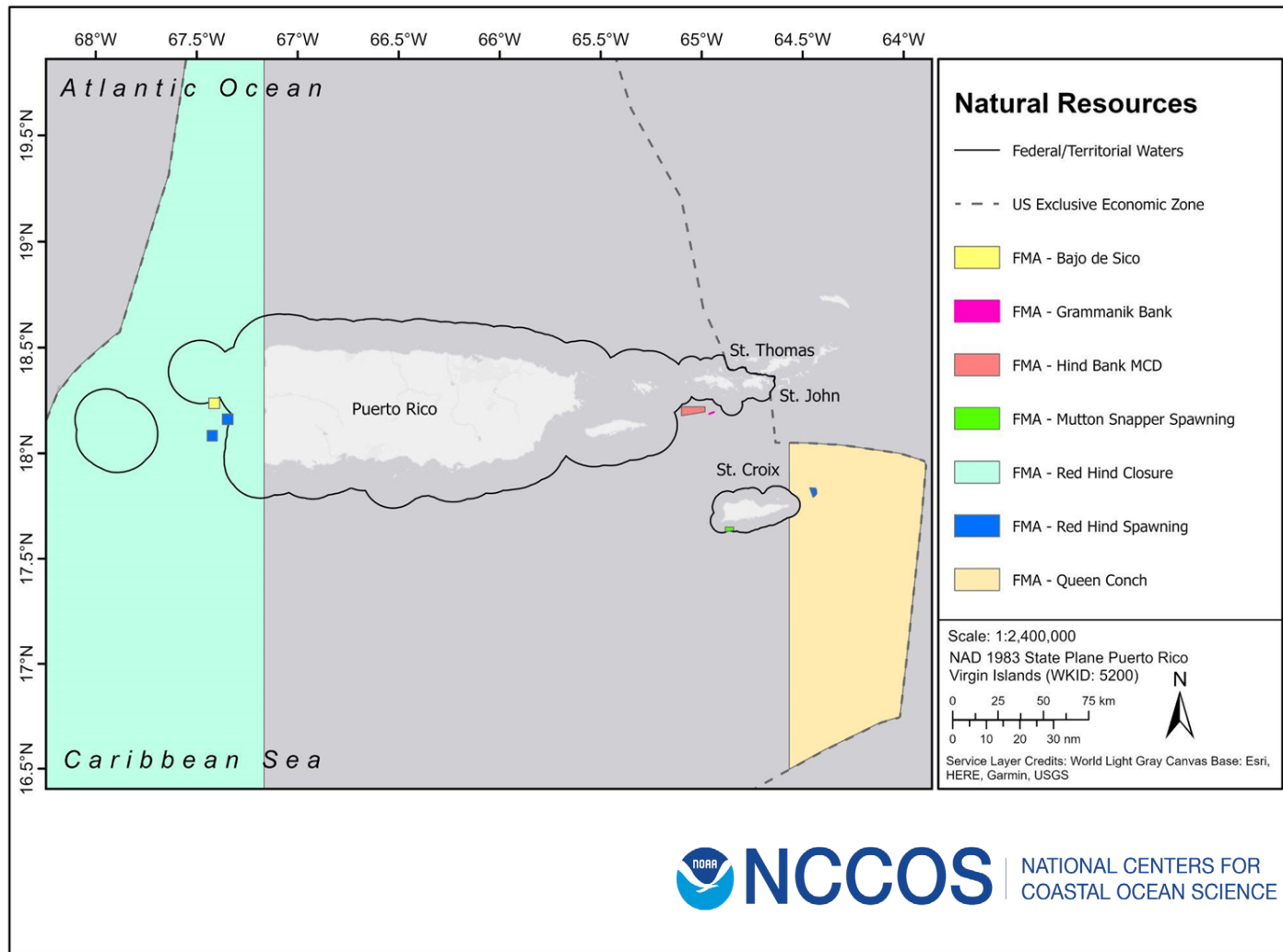**Red Hind Closure Reef Fish**
Data Link

Red Hind Spawning Aggregation
Data Link

Queen Conch
Data Link

Type: Polygon
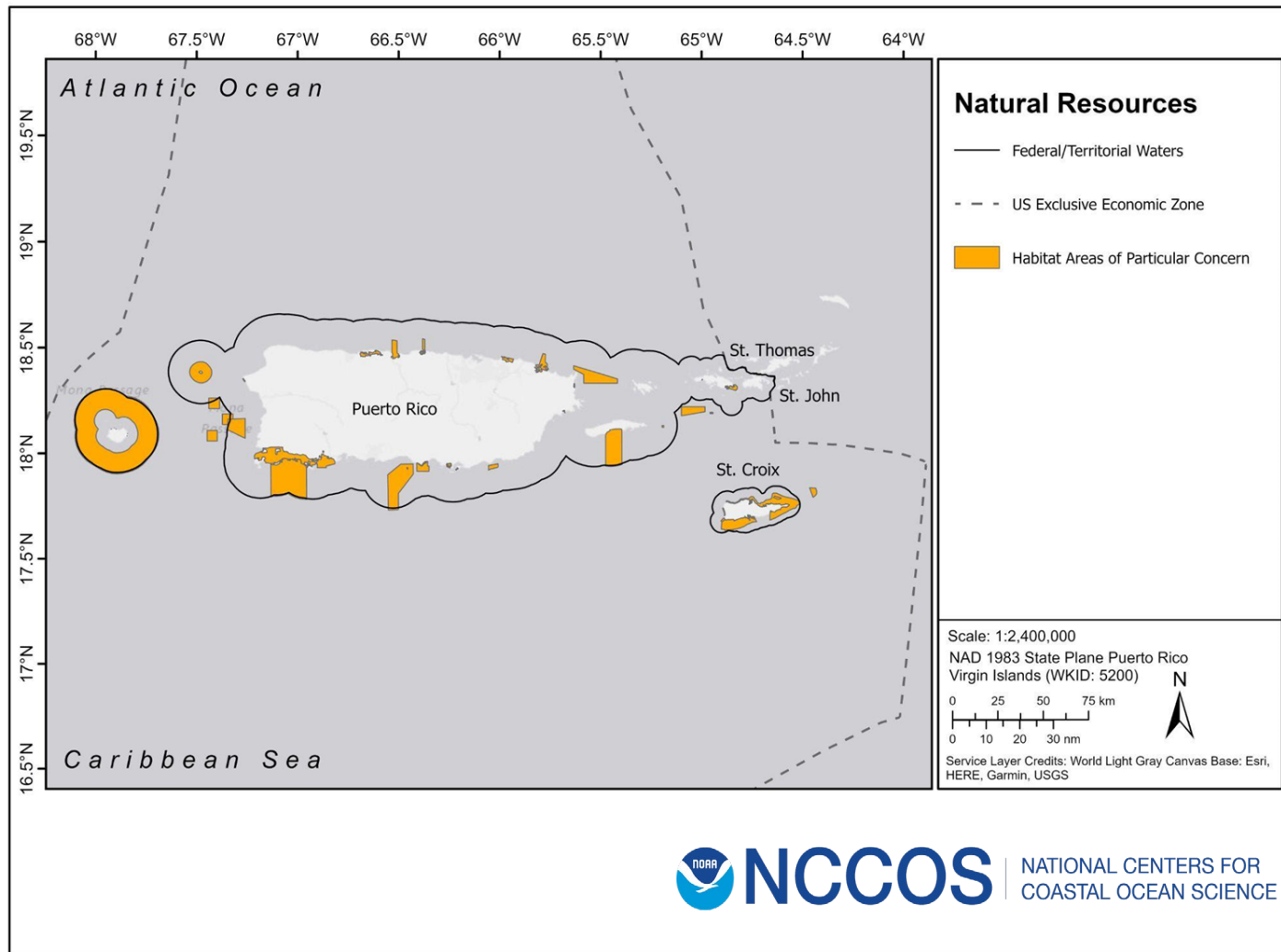
Original Source: NOAA NMFS

Habitat Areas of Particular Concern

Summary: The Caribbean region includes Puerto Rico and the United States Virgin Islands. These islands are part of NOAA Fisheries' Southeast Region. The Caribbean Fishery Management Council has designated a large number of discrete sites as HAPCs under its Reef Fish and Coral Fishery Management Plans.

Type: Polygon

Original Source: NOAA NMFS / CFMC

[Data Link](#)

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

■ Habitat Areas of Particular Concern

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

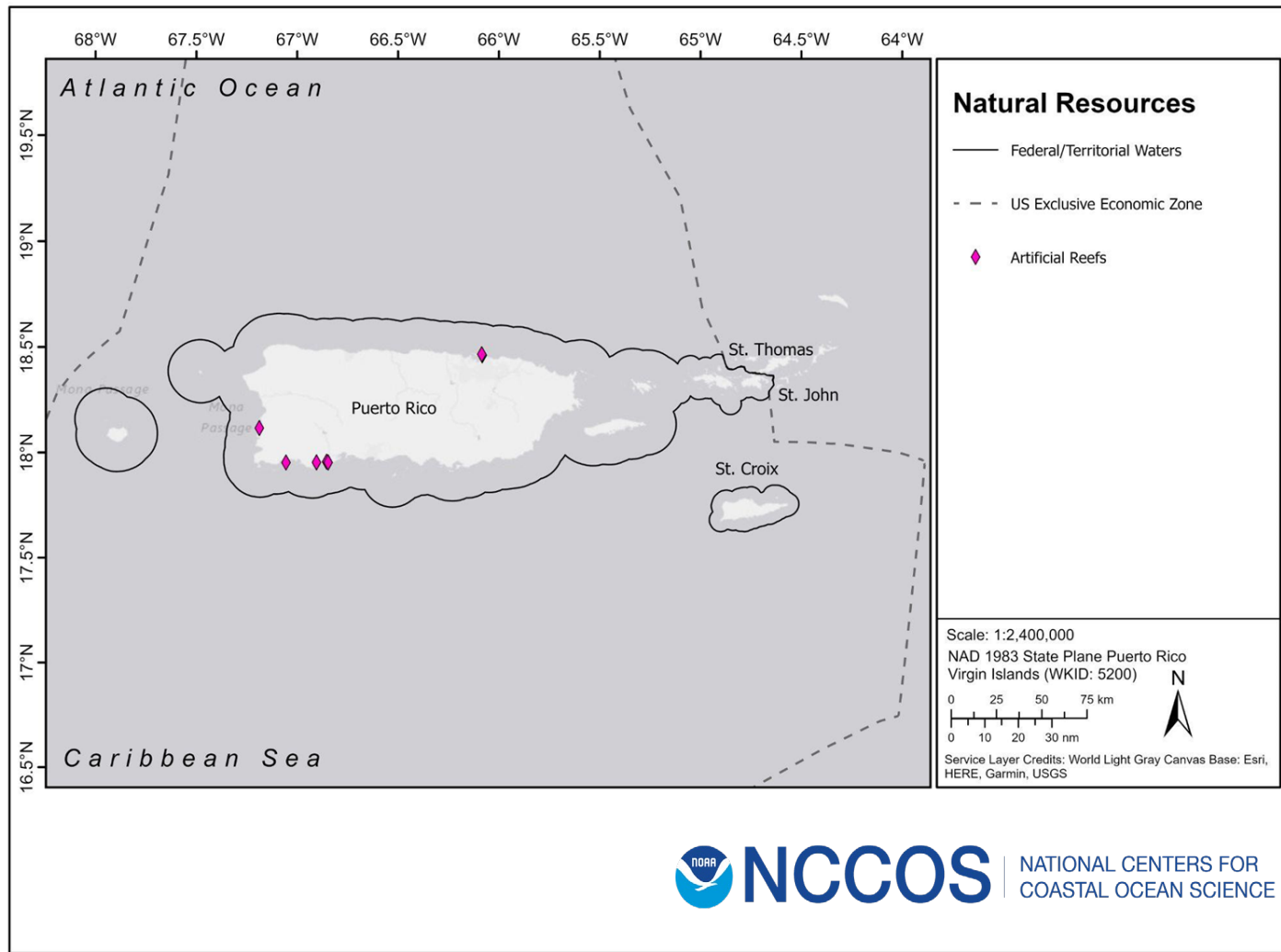**NCCOS** | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Artificial Reefs

Summary: Artificial reefs provide new or enhanced hard-bottom habitat to areas that may or may not be habitat limited. Artificial habitat provides space that is quickly colonized by sessile organisms and provides new food sources, greater protection of juveniles by providing more space to be used as refuge, and a possible focal point for aggregating adults to spawn. Traditionally, the majority of artificial reefs in United States coastal marine waters have been sited and built to enhance recreational fishing.

Type: Point

Original Source: NOAA OCM, BOEM, FWC, DNR

Data Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

◆ Artificial Reefs

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS
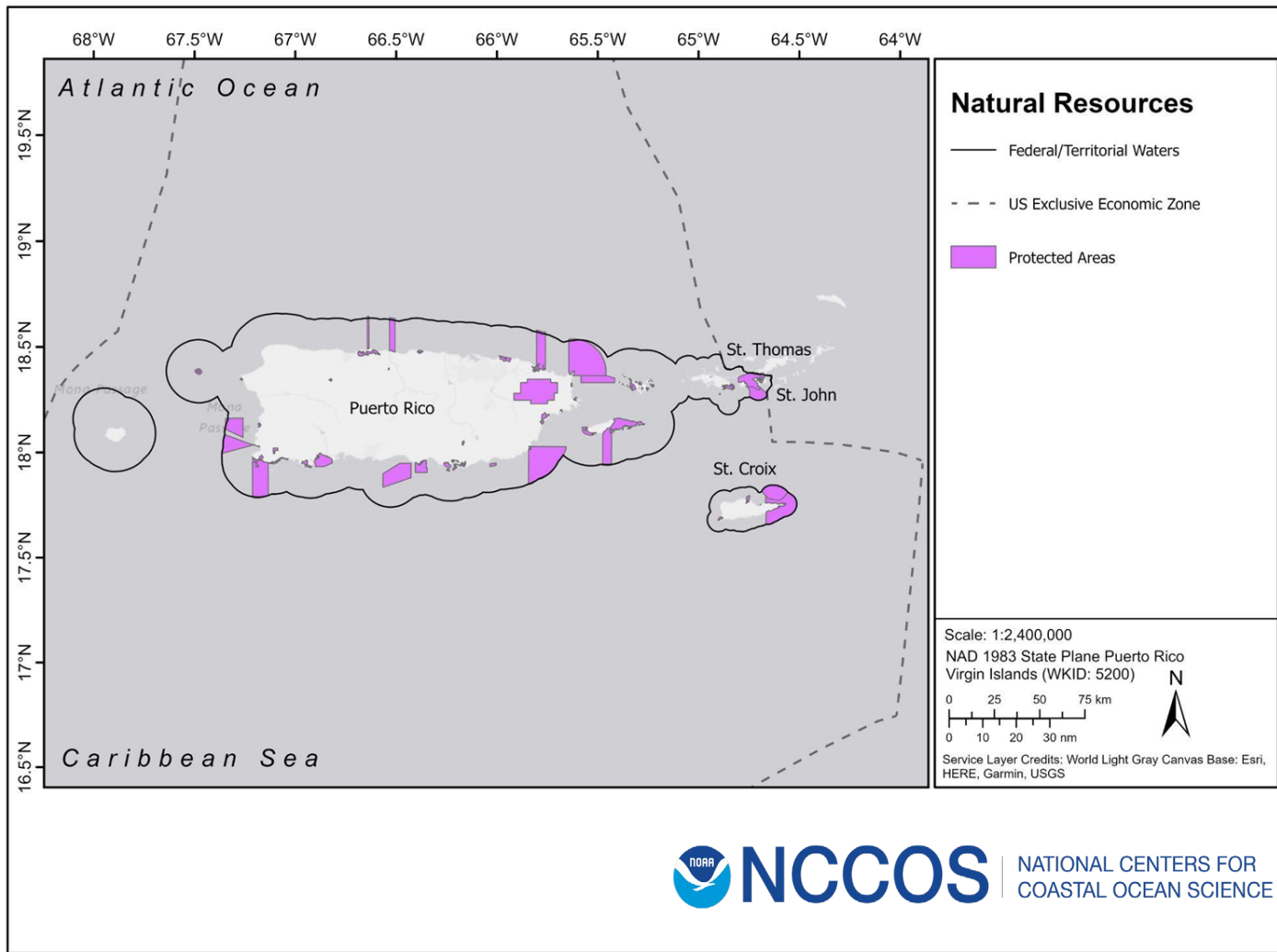
Protected Areas

Summary: These data represent the geographic boundaries of marine and terrestrial protected areas in the Puerto Rico and the US Virgin Islands. Marine features are shown for U.S. state and federal waters as well as those located within 20 miles of coastal submerged lands including hydrologically related rivers and bays.

Type: Polygon

Original Source: USGS, USFS, NPS, BLM

Data Link / Metadata Link

Natural Resources

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

■ Protected Areas

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

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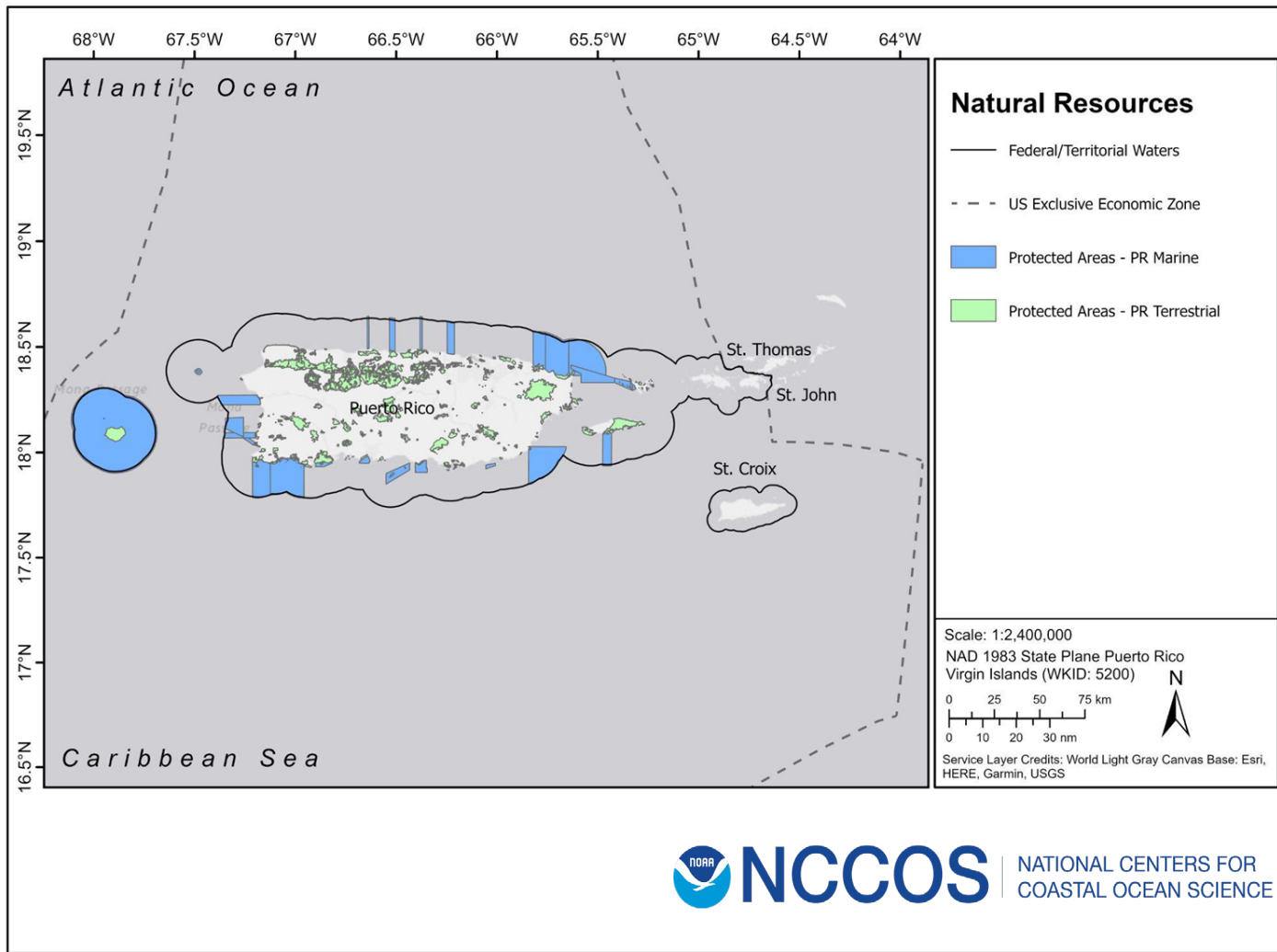
Puerto Rico Protected Natural Areas

Summary: This dataset includes the terrestrial and marine protected natural areas of Puerto Rico compiled by the Protected Areas Conservation Action Team (PACAT) as of December 2018. The PACAT is an interagency team with members from the Puerto Rico Department of Natural and Environmental Resources, Puerto Rico Planning Board, Para la Naturaleza, USDA Forest Service, and US Fish and Wildlife Service.

Type: Polygon

Original Source: USDA, USFS, USFWS

Data Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

▢ Protected Areas - PR Marine

▢ Protected Areas - PR Terrestrial

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Atlantic Ocean

Puerto Rico

Mona Passage
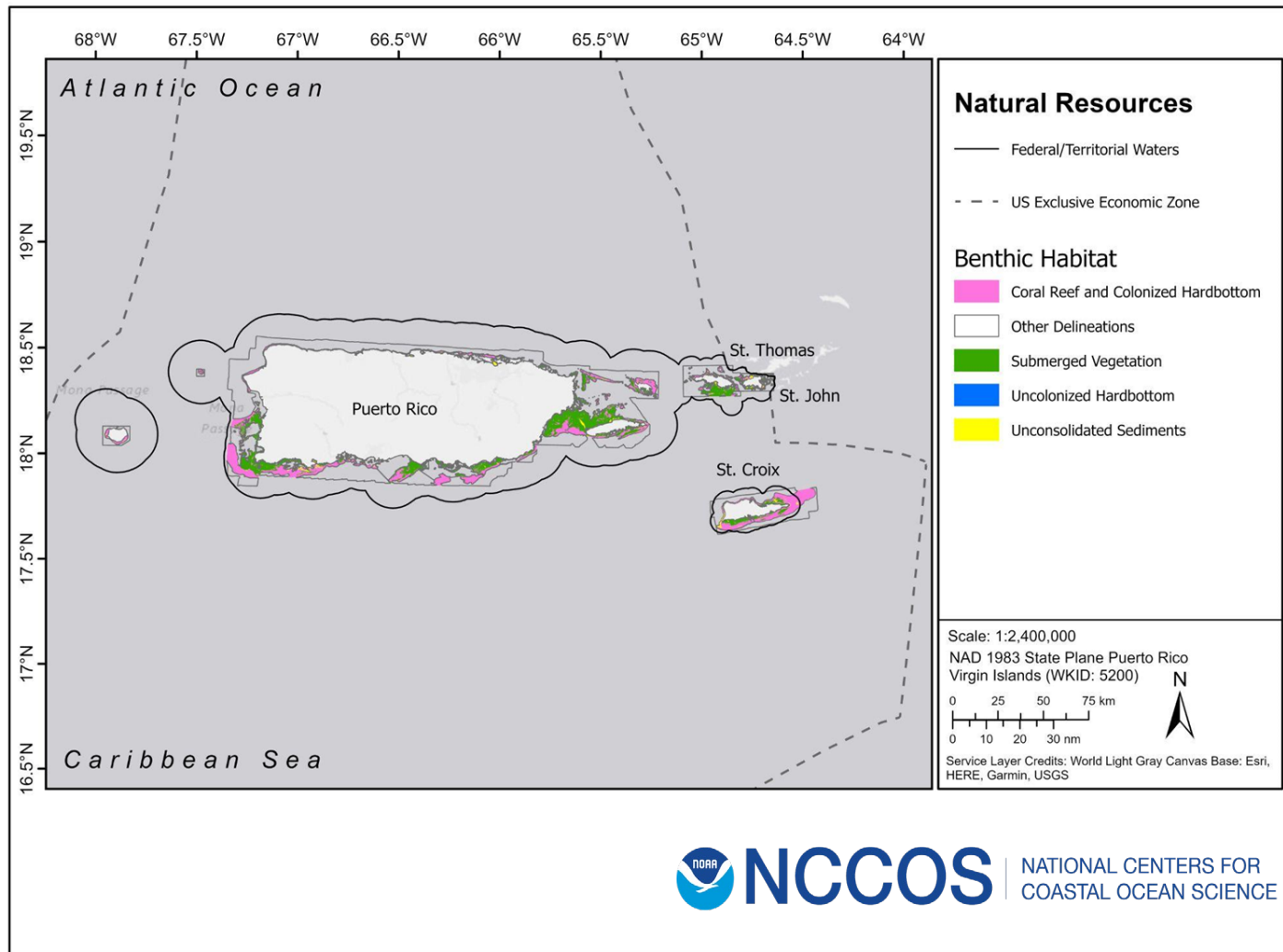
St. Thomas

St. John

St. Croix

Caribbean Sea

Benthic Habitat - NOAA

Summary: Mapped 21 distinct benthic habitat types within eight zones using visual interpretation of orthorectified aerial photographs

Type: Polygon

Original Source: NOAA NCCOS

Data Link

Benthic Habitat - NOAA (PR)

Coral Habitat Map: This tiled layer displays coral habitat data related to the archipelago of Puerto Rico. Only the habitats used in the hurricane coral reef assessment and triage effort in Puerto Rico in 2018 are shown.

Data Link / Metadata Link

NE Reserve Habitats Puerto Rico: The habitat map highlighted in this tiled layer are results from a larger NOAA-NCCOS effort. Habitat layers used to support the Hurricane Coral Reef Assessment and Triage effort conducted in Puerto Rico in 2018 are shown.
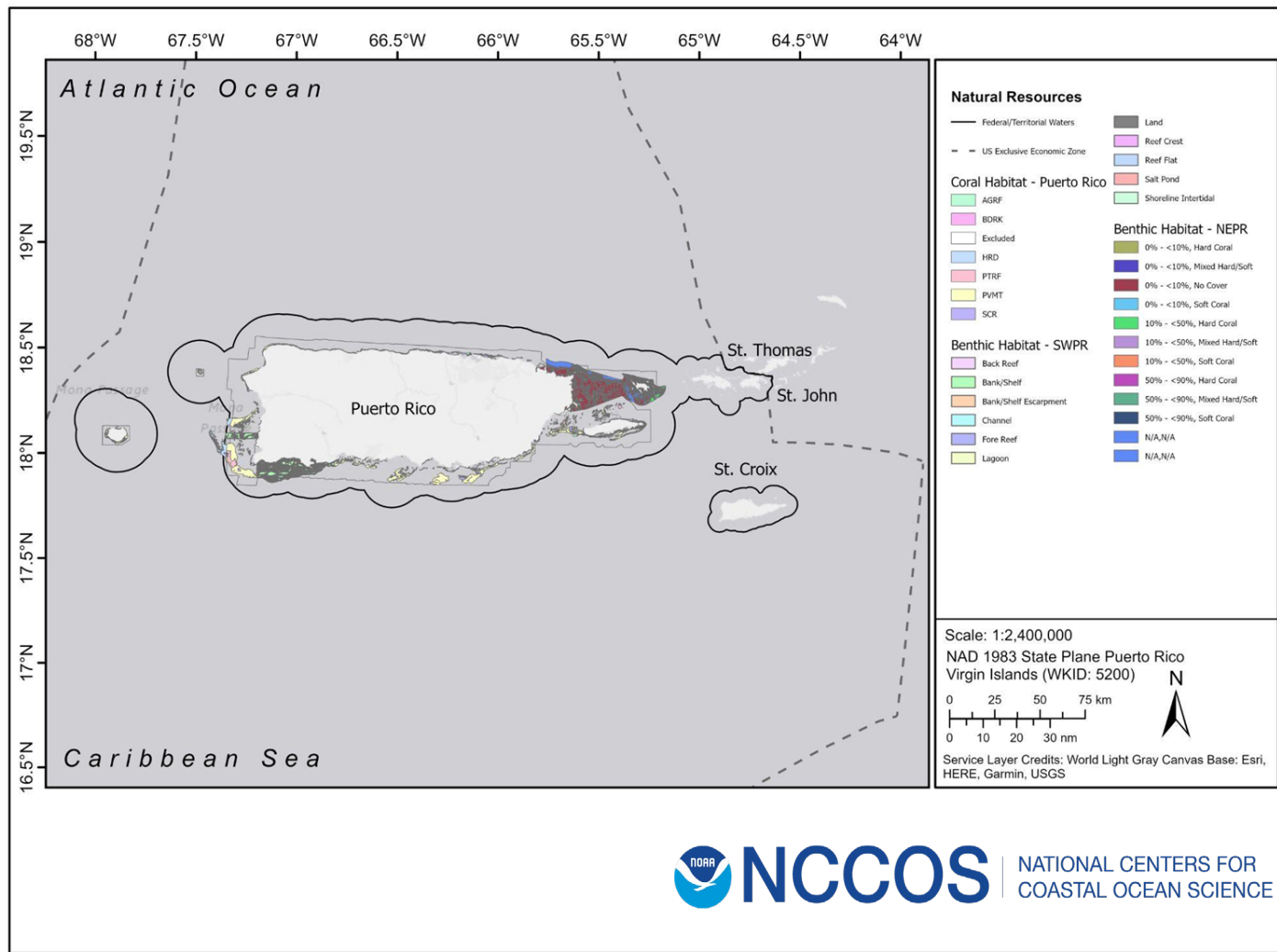
Data Link / Metadata Link

Shallow-Water Benthic Habitats of Southwest Puerto Rico: shallow-water benthic habitats of two areas off southwest Puerto Rico. This effort improves on previous NOAA benthic habitat maps by using more recent imagery, a smaller minimum mapping unit, and a refined classification scheme.

Data Link

Type: Polygon
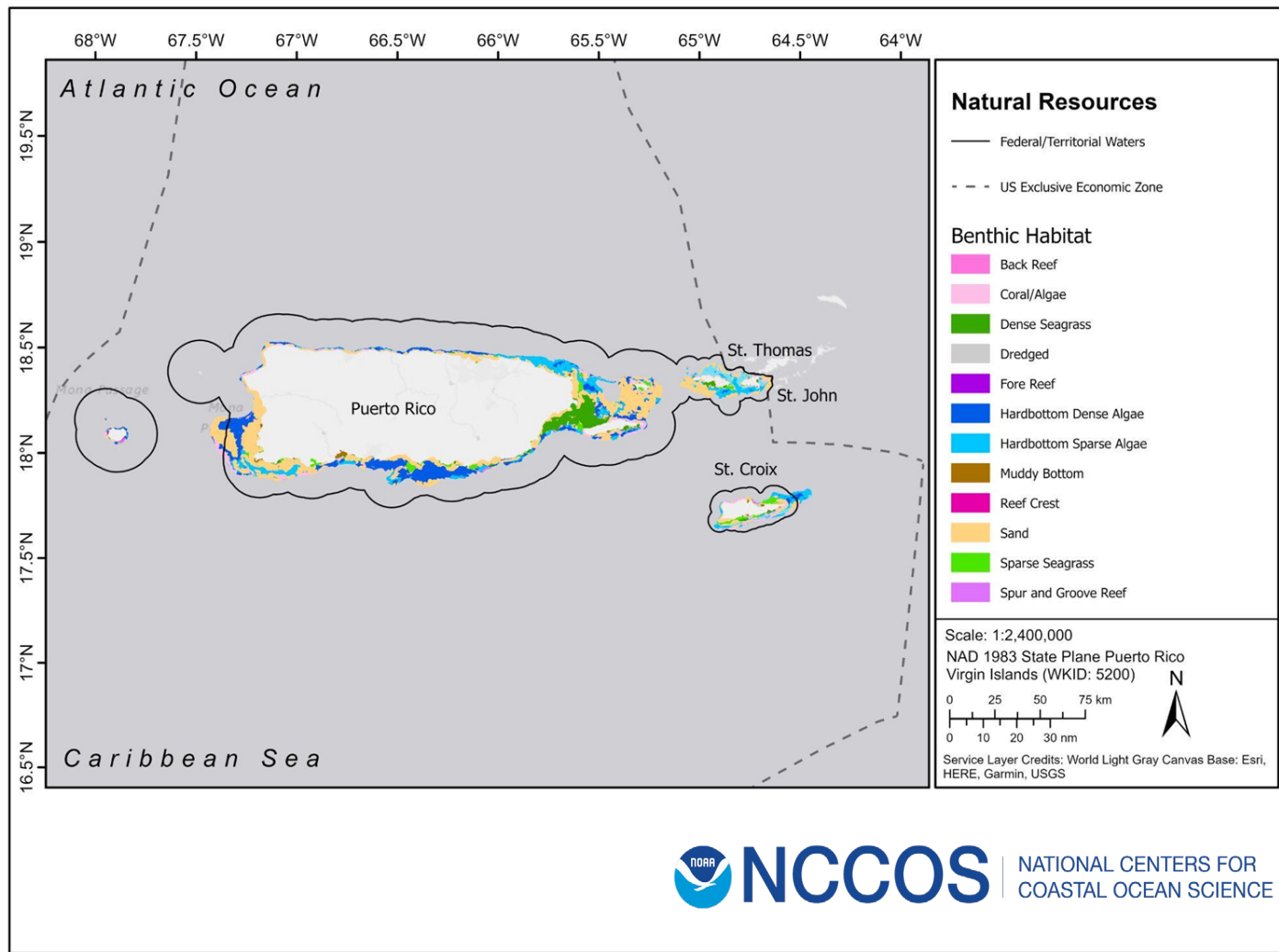
Original Source: NOAA NCCOS

Benthic Habitat - TNC

Summary: The Nature Conservancy (TNC) has developed a first-of-its-kind, high-resolution benthic habitat map for shallow areas across the wider Caribbean region.

Type: Polygon
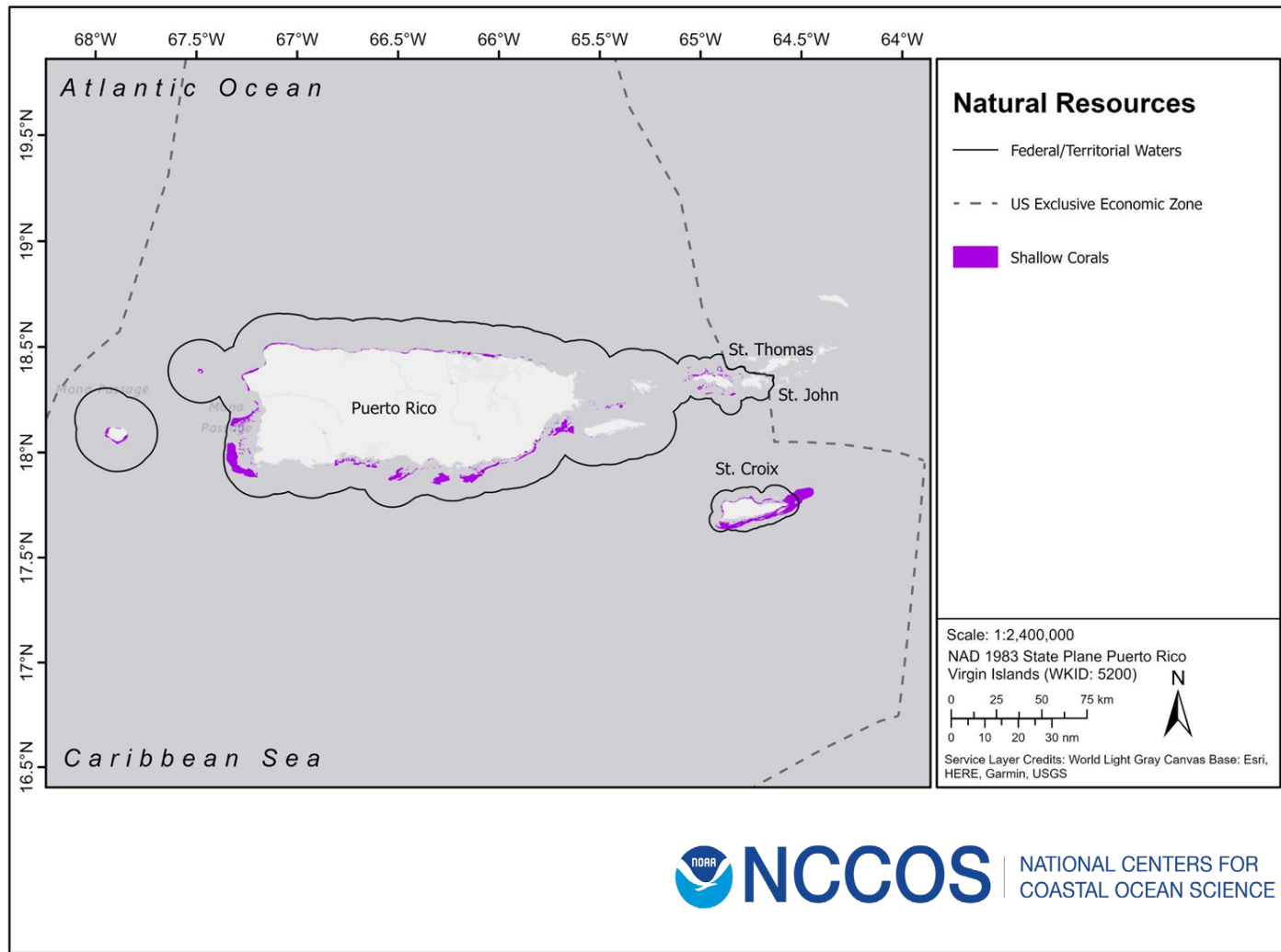
Original Source: TNC

Data Link

Shallow Corals

Summary: Shallow Corals were extracted from the Benthic Cover described herein by exporting all features classified as "B2.1.2" within the Biotic Cover Code field. Benthic cover (habitat) maps are derived from aerial imagery, underwater photos, acoustic surveys, and data gathered from sediment samples.

Type: Polygon

Original Source: NOAA OCM / NCCOS

Data Link / Metadata Link

Natural Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

Shallow Corals

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

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Acropora Presence & Priority Sites

Summary: Reported sightings of Acropora palmata and Acropora cervicornis. These agencies include NOAA, National Park Service, FWC, University of Miami, University of North Carolina - Wilmington, National Coral Reef Institute and The Nature Conservancy. All datasets include Acropora presence/absence and latitudinal /longitudinal coordinates at the minimum. This project was funded by award NA1ONMF4720029 from the National Oceanic and Atmospheric Administration/National Marine Fisheries Service, U.S. Department of Commerce.

Type: Polygon

Original Source: FL FWS

Data Link / Metadata Link

NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
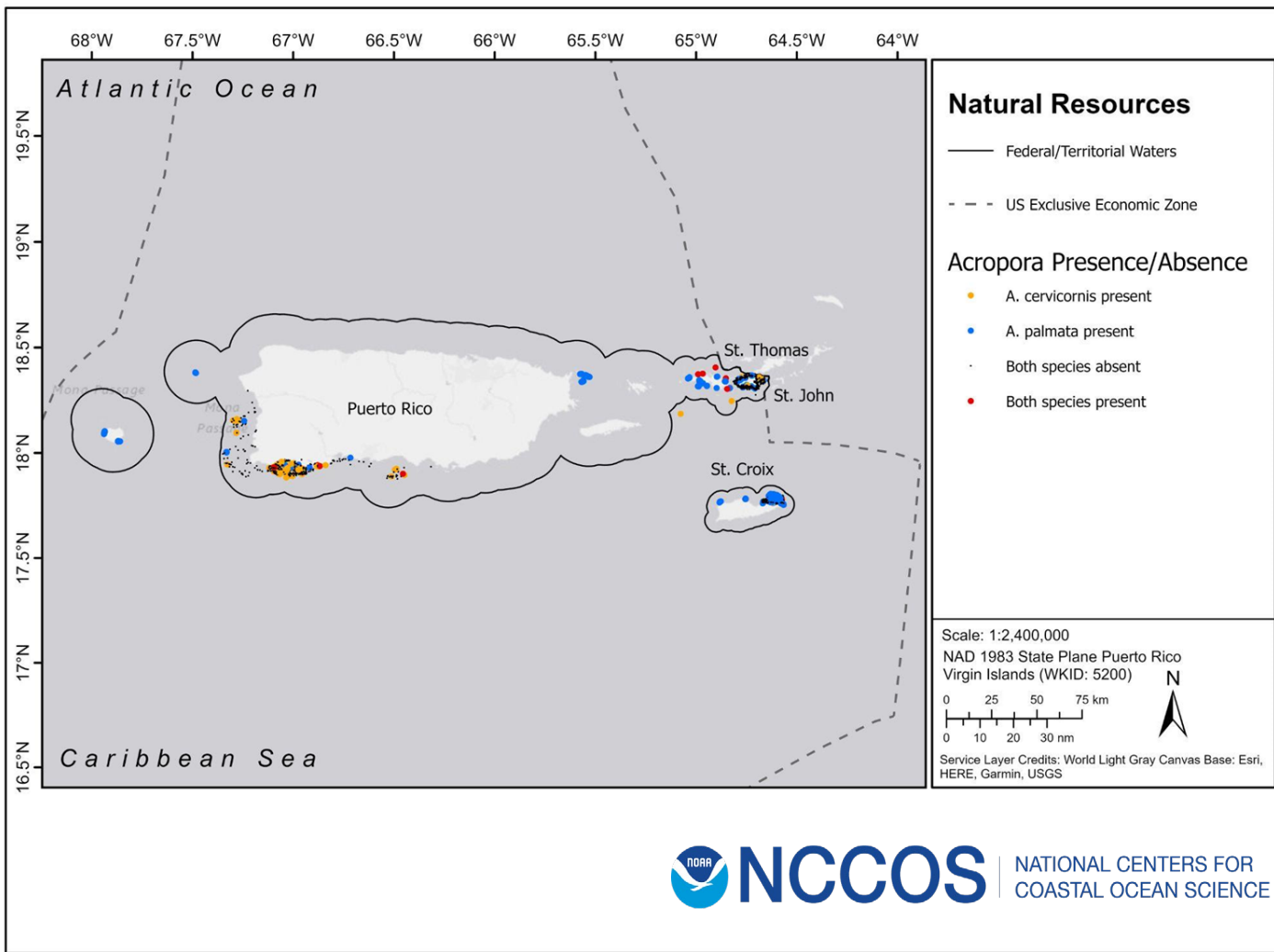
Deep Sea Coral and Sponge Observations

Summary: NOAA's Deep-Sea Coral Research and Technology Program (DSCRTP) compiles a national database of the known locations of deep-sea corals and sponges in US territorial waters and beyond. The structure of the database is tailored to occurrence records of all the azooxanthellate corals, a subset of all corals, and all sponge species.

Type: Point

Original Source: NOAA NCEI / DSCRTP

Data Link / Metadata Link
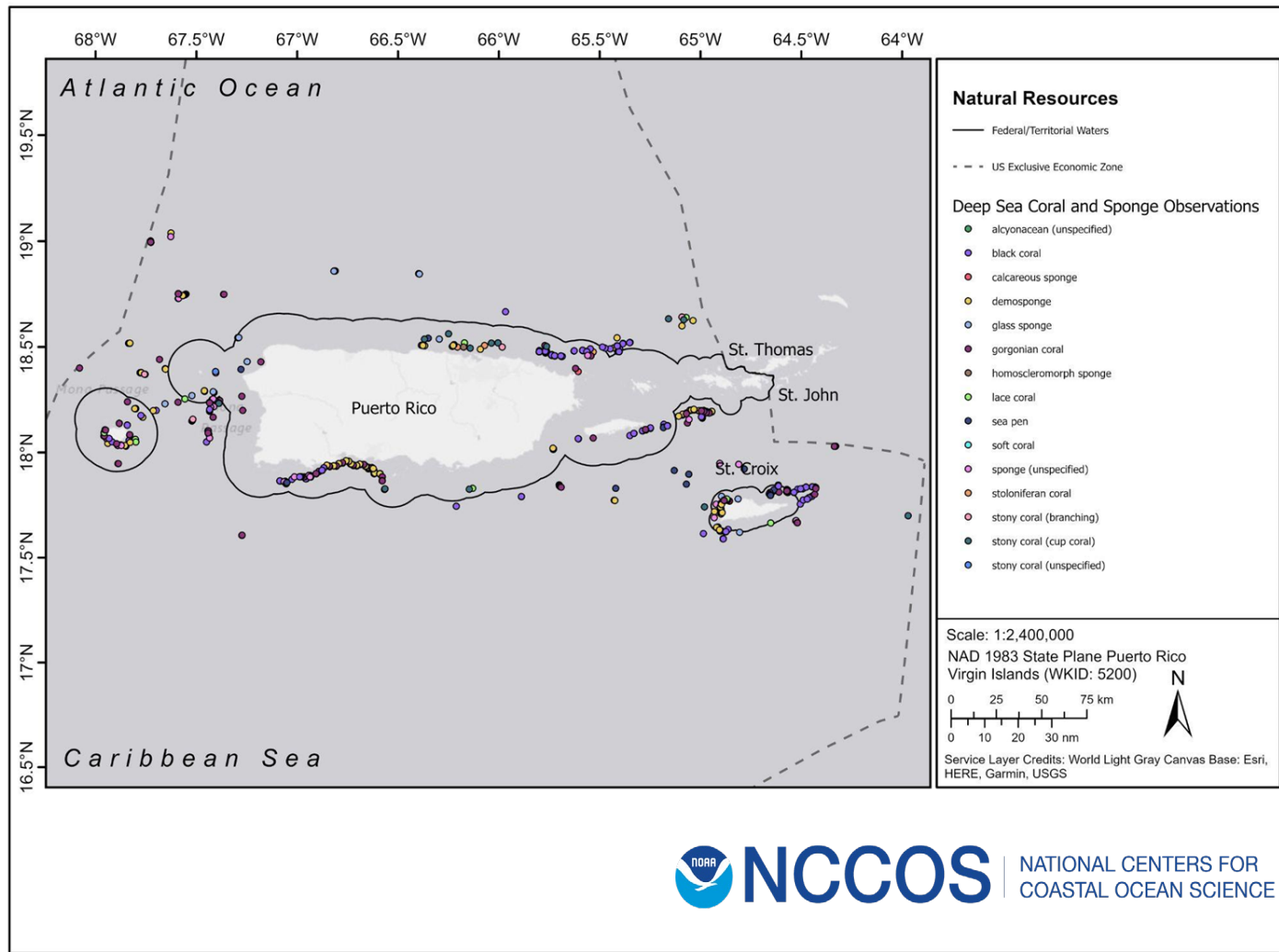
Seagrasses

Summary: These data show aquatic vascular vegetation beds dominated by submerged, rooted, vascular species or submerged or rooted floating freshwater tidal vascular vegetation. The presence and location of the seagrasses have been derived from multiple state and federal sources.

Type: Point

Original Source: NOAA

Data Link
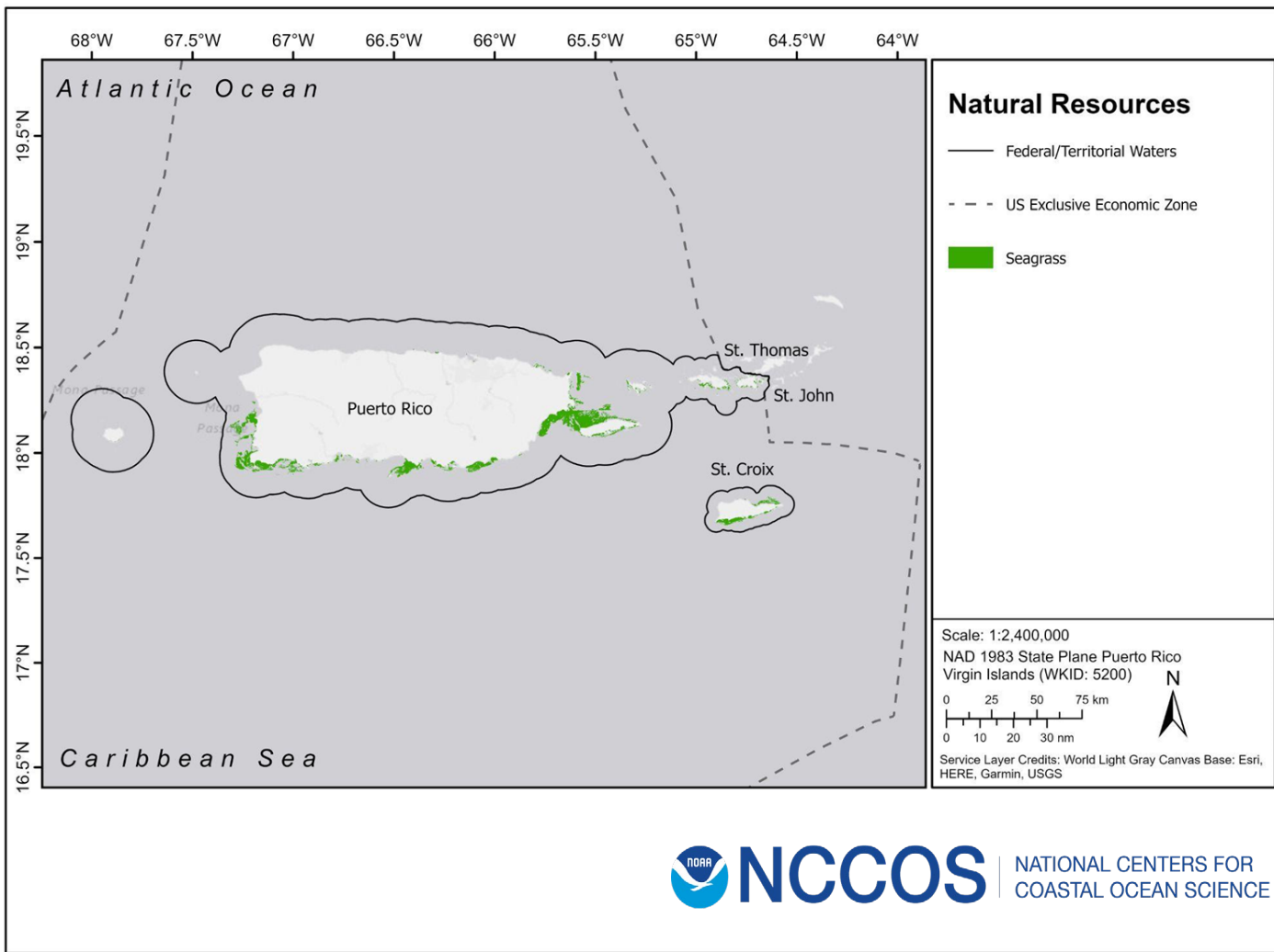
Bird Observations

Summary: The EBD is the core dataset for accessing all raw eBird observations and associated metadata. The EBD is updated monthly (15th of each month), and is available by direct download through eBird to any logged-in user after completion of a data request form. Data are provided with documentation in spreadsheet format, which can be read by a variety of programs.

Type: Point

Original Source: eBird / Birds Caribbean

Data Link
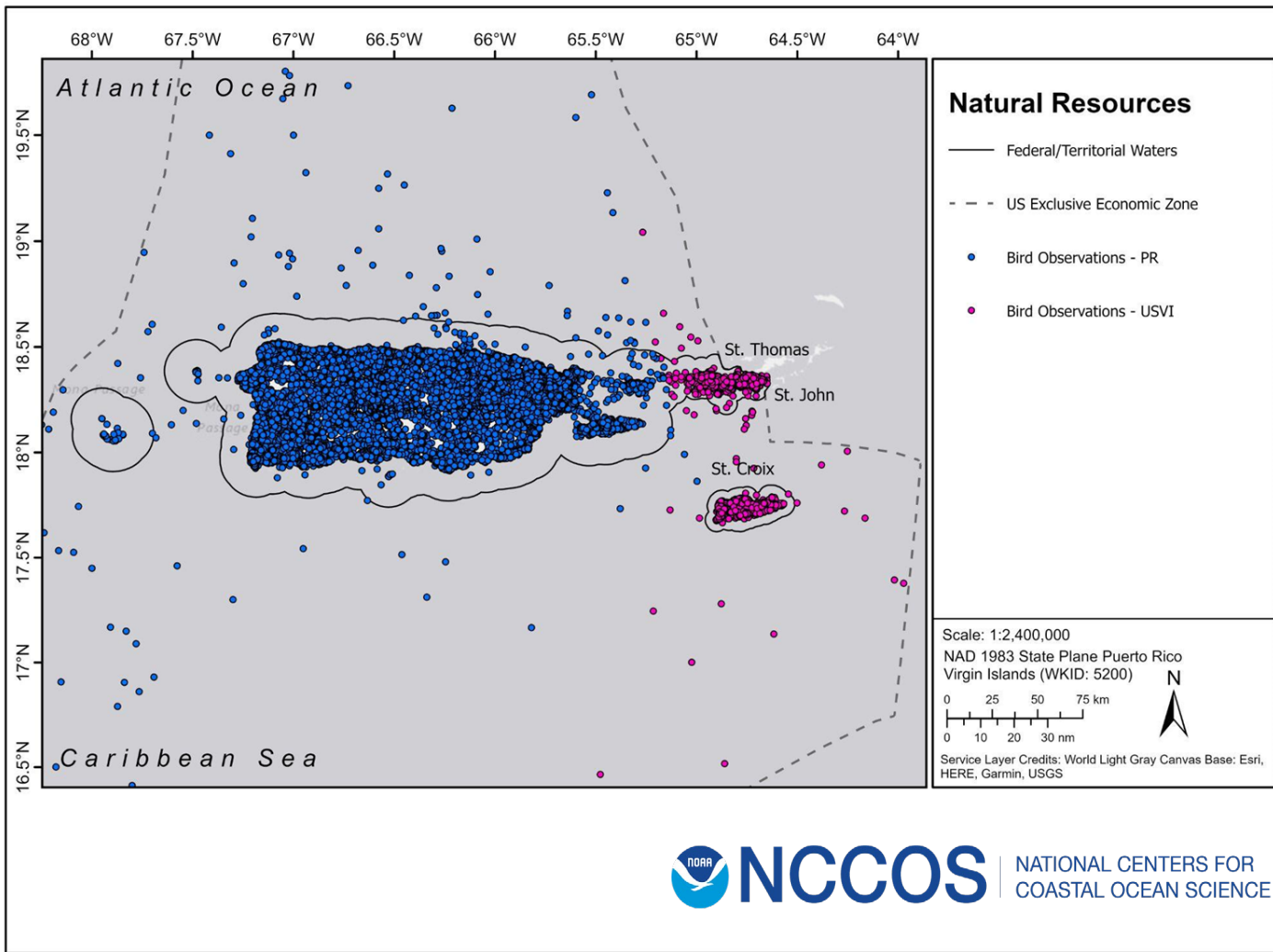
Marine Mammals & Protected Species

- **Sea turtle**
  - State of the World's Sea Turtles (SWOT): includes telemetry and nesting data summary specific to turtles in the Caribbean (SWOT - SEAMAP Duke University)
  - Proposed rule to designate critical habitat for green sea turtles (NOAA NMFS)
  - Information on strandings of sea turtles (Sea Turtle Stranding and Salvage Network)
  - Atlas of sea turtles nesting habitat (TNC & Sea Turtle Conservation Network)
- **Protected species**
  - Marine species distributions and biodiversity (OBIS-SEAMAP)
  - Animal telemetry network (Integrated Ocean Observing System)
  - Acoustic telemetry for fish and sea turtles(SECOORA - FACT Network)
  - Animal tracking data (Movebank - Max Planck Institute of Animal Behavior)
  - List of data references with owners for the report - migratory whales navigating international and national seas
- **Marine mammals**
  - Dwarf and pygmy sperm whales: location in Puerto Rico and the Virgin ISlands
  - Cetacean strandings in Puerto Rico and Virgin Islands
  - Beaked whales: new records of beaked whales
  - Dolphins: modeling distribution of common bottlenose dolphin in SW Puerto Rico
  - Caribbean strandings (National Marine Mammal Stranding Database)
  - Passive acoustic monitoring map - NOAA NMFS

Cultural and Social Resources

Cultural uses of the environment, social vulnerability, demographic data, archaeological sites

National Centers for Coastal and Ocean Science
National Marine Fisheries Service

James.Morris@noaa.gov
Jennifer.Wright@noaa.gov

Historic Lighthouses

Summary: This dataset includes lighthouses in coastal areas that may or may not be official or active aids for navigation. This dataset is a compilation of lighthouses identified from various official data sources: Aids to Navigation (ATON), National Geodetic Survey (NGS), National Park Service (NPS), and the National Oceanic and Atmospheric Administration (NOAA).

Type: Point

Original Source: US Coast Guard, NPS, NOAA National Geodetic Survey, BOEM, NOAA OCM
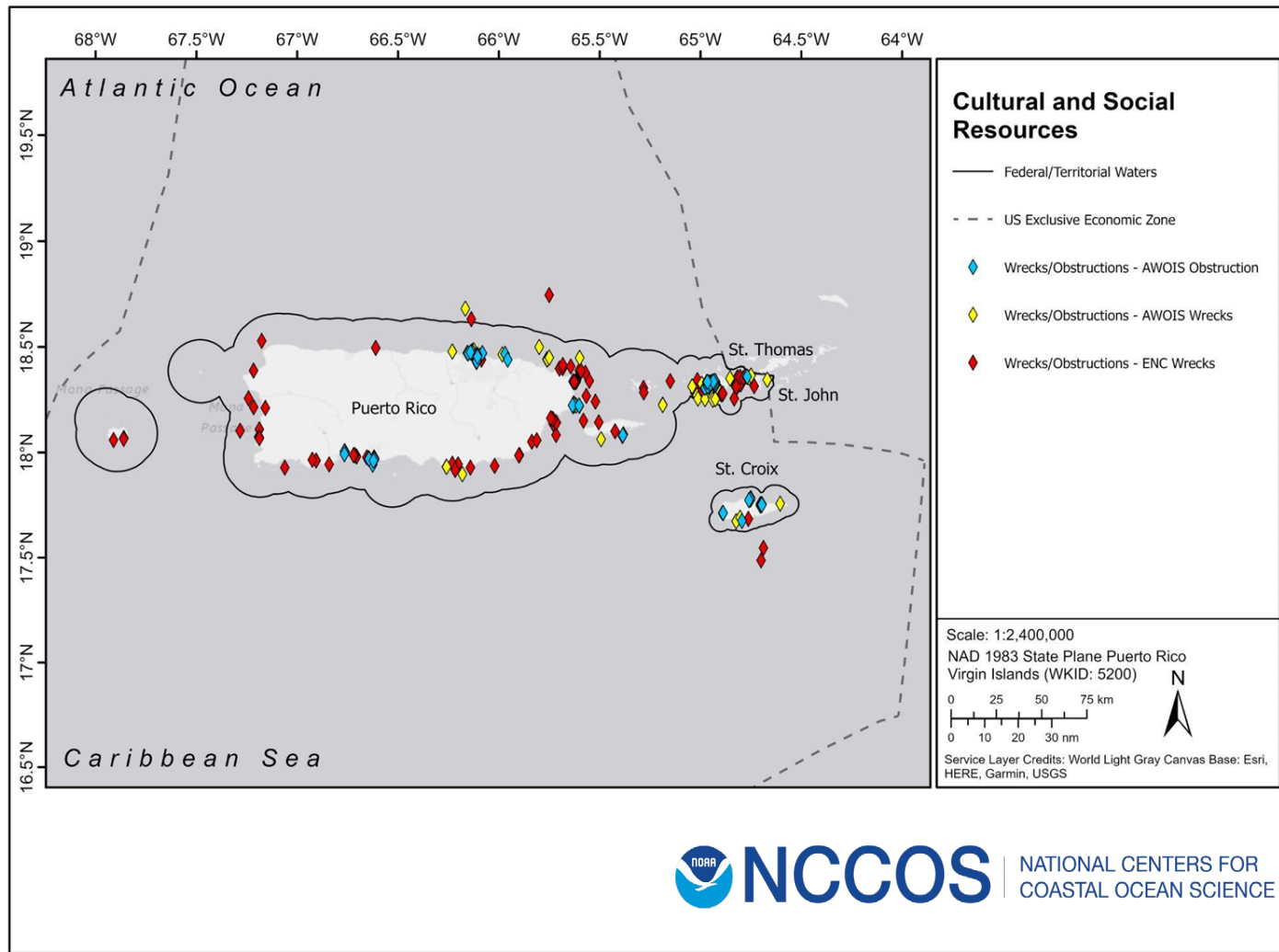
Data Link
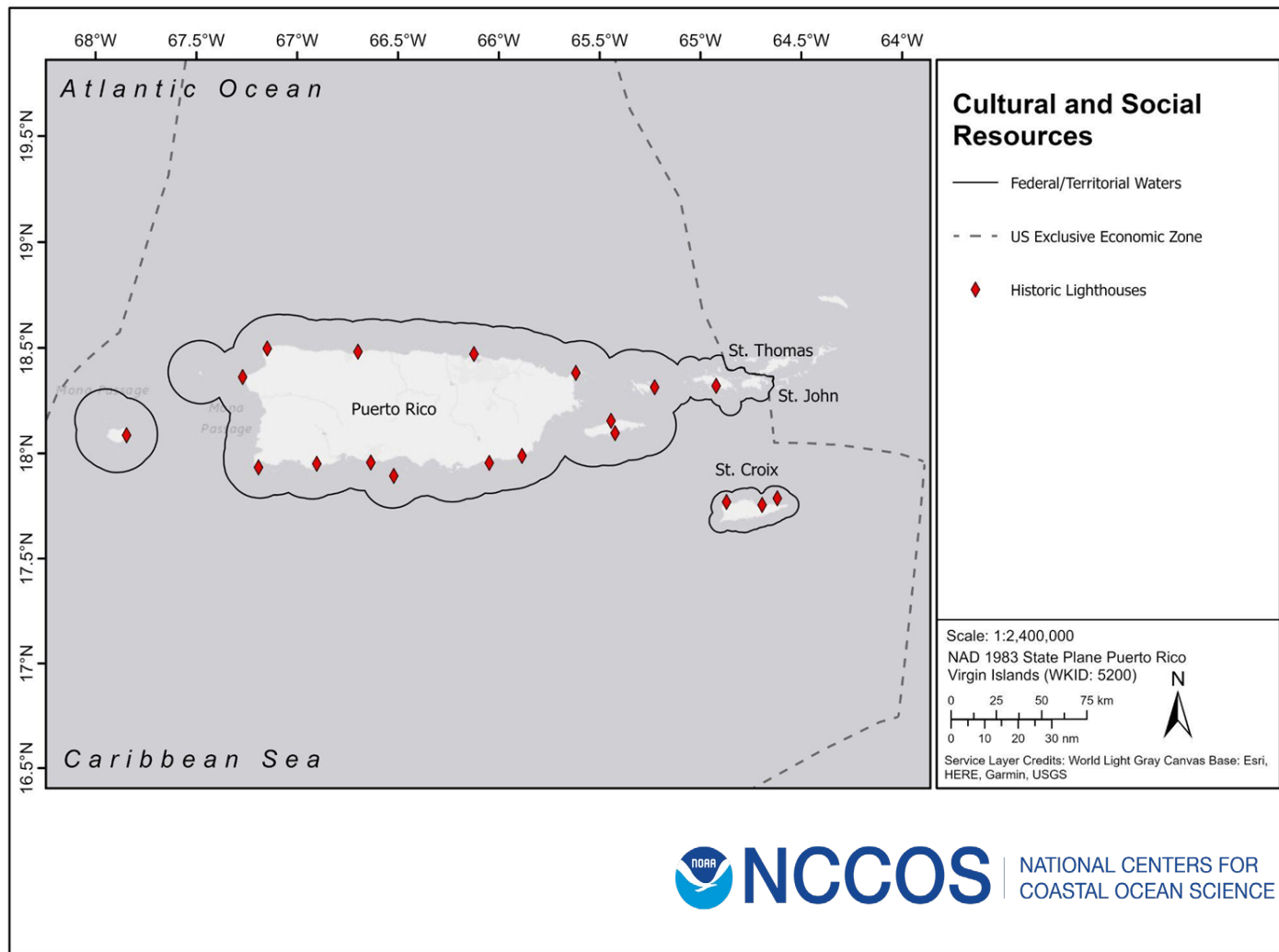
Wrecks and Obstructions

Summary: The Automated Wreck and Obstruction Information System (AWOIS) and Electronic Navigational Charts (ENC) contain information on over 10,000 submerged wrecks and obstructions in the coastal waters of the United States.

Type: Point

Original Source: NOAA Office of Coast Survey

Data Link

Protected Areas

Protected Areas: marine and terrestrial protected areas in Puerto Rico and the US Virgin Islands. Marine features are shown for U.S. state and federal waters as well as those located within 20 miles of coastal submerged lands including hydrologically related rivers and bays.
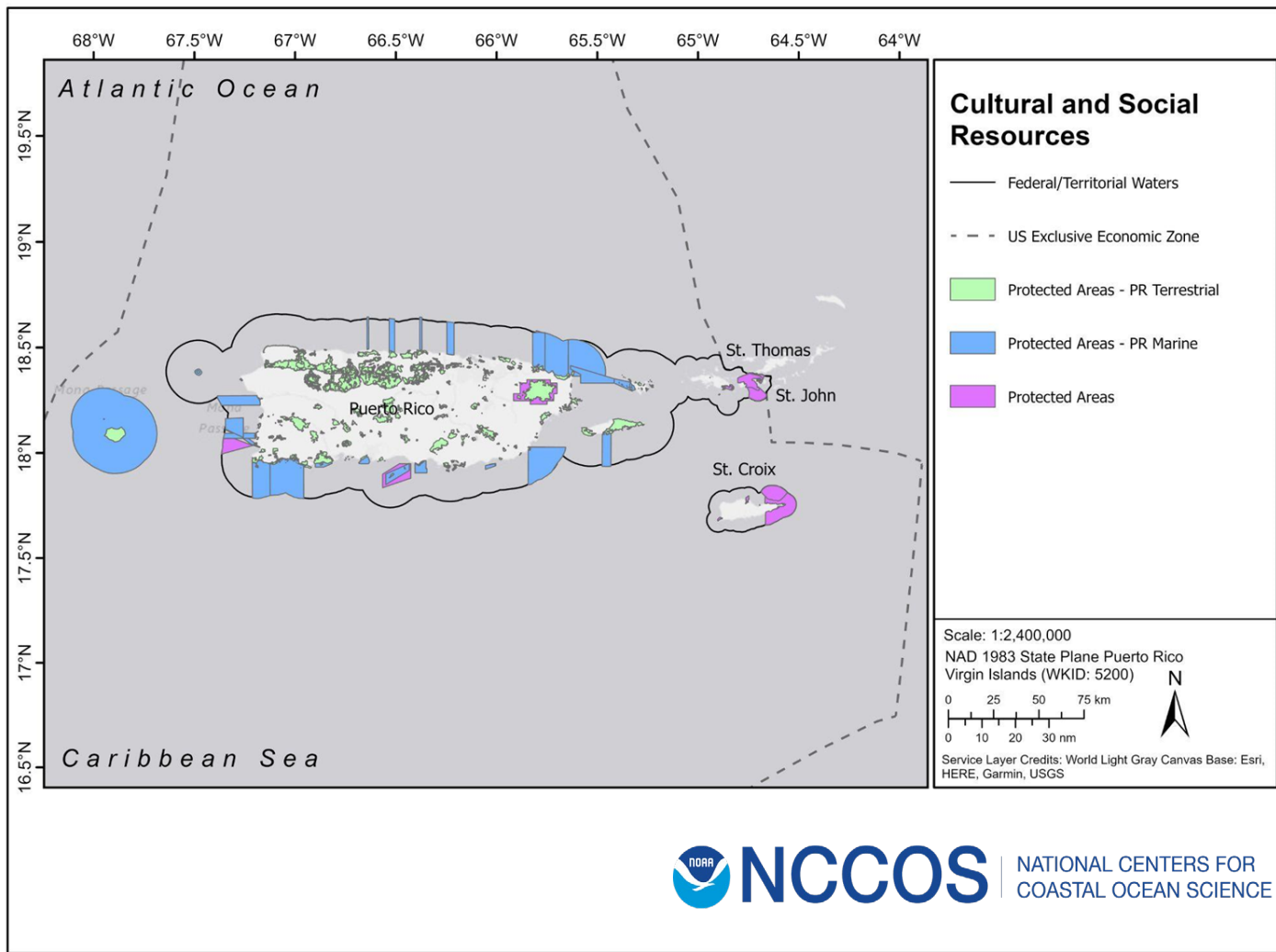
Type: Polygon

Original Source: USGS, USFS, NPS, BLM

Data Link / Metadata Link

Puerto Rico Protected Natural Areas: Terrestrial and marine protected natural areas of Puerto Rico compiled by the Protected Areas Conservation Action Team (PACAT) as of December 2018.

Type: Polygon

Original Source: USDA, USFS, USFWS

Data Link

Cultural and Social Resources

— Federal/Territorial Waters

--- US Exclusive Economic Zone

Protected Areas - PR Terrestrial

Protected Areas - PR Marine

Protected Areas

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

Atlantic Ocean

Caribbean Sea

Puerto Rico

St. Thomas
St. John
St. Croix

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NCRMP 2022 Socioeconomic Survey

Summary: National Coral Reef Monitoring Program resident survey in Puerto Rico. The national survey collects information on resident use of coral reefs, knowledge, attitudes, and perceptions of coral reefs and management. The second cycle of the Puerto Rico socioeconomic survey took take place from January through mid summer 2022; 45 Puerto Rican municipalities were randomly selected for surveying and residents within these areas were randomly selected and invited to participate in the survey. The report and data from this resident survey should be available by end of 2023.

Type: Polygon

Original Source: NOAA NCRMP

Project Link
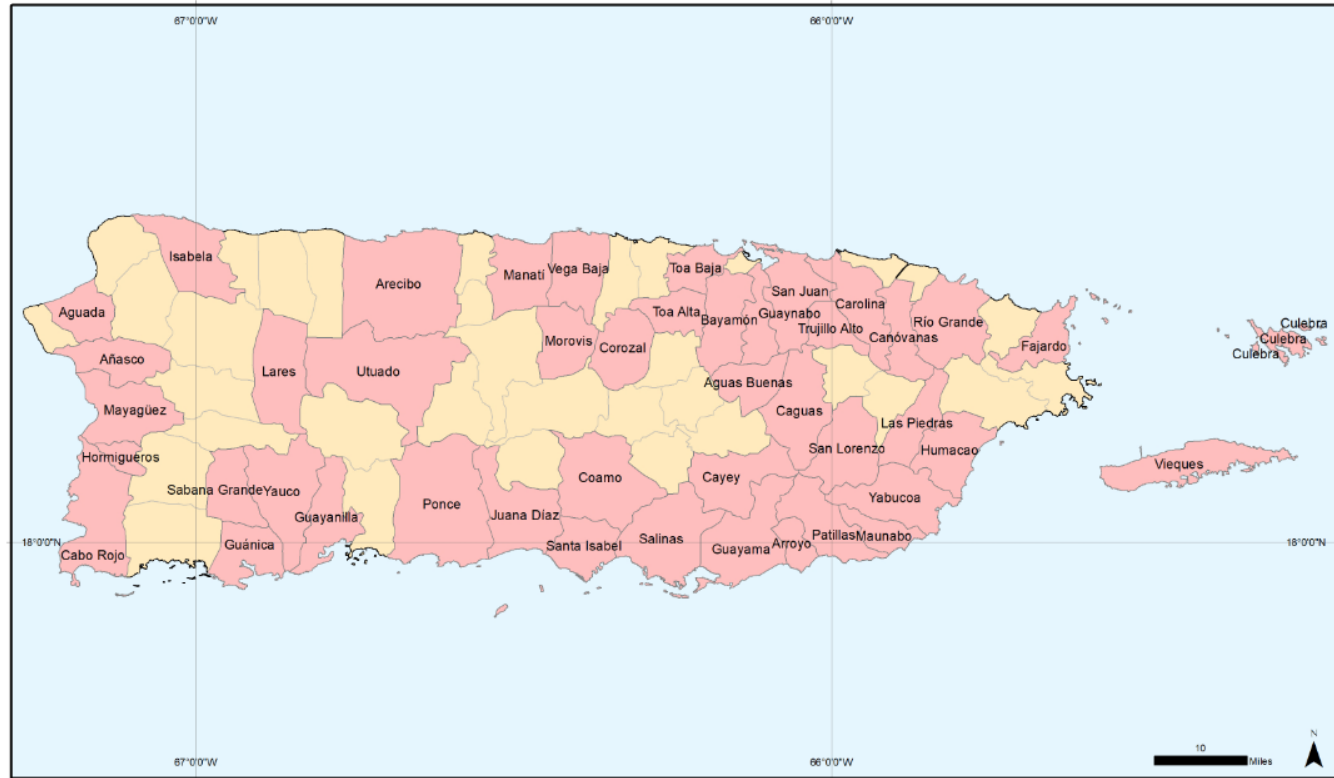
Map of municipalities randomly selected to participate in the NCRMP socioeconomic survey.

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Cultural and Social Resources

Additional Types of Data of Interest

- Coastal demographic data

- Community social vulnerability data

- Traditional and current territory of tribes or native and traditional populations

- Traditional/ceremonial or important recreational uses of marine or coastal areas (dive sites, sandbars, transit routes to those areas, etc)

- Underwater or coastal actual or possible archeological sites

- Coastal land tenure/land use

- Fishing territories at sea

- Coastal infrastructure/working waterfronts

Metocean and Other

Meteorological and oceanographic conditions (temp, wind, currents, etc.), bathymetry, shoreline, boundaries

National Centers for Coastal and Ocean Science
National Marine Fisheries Service

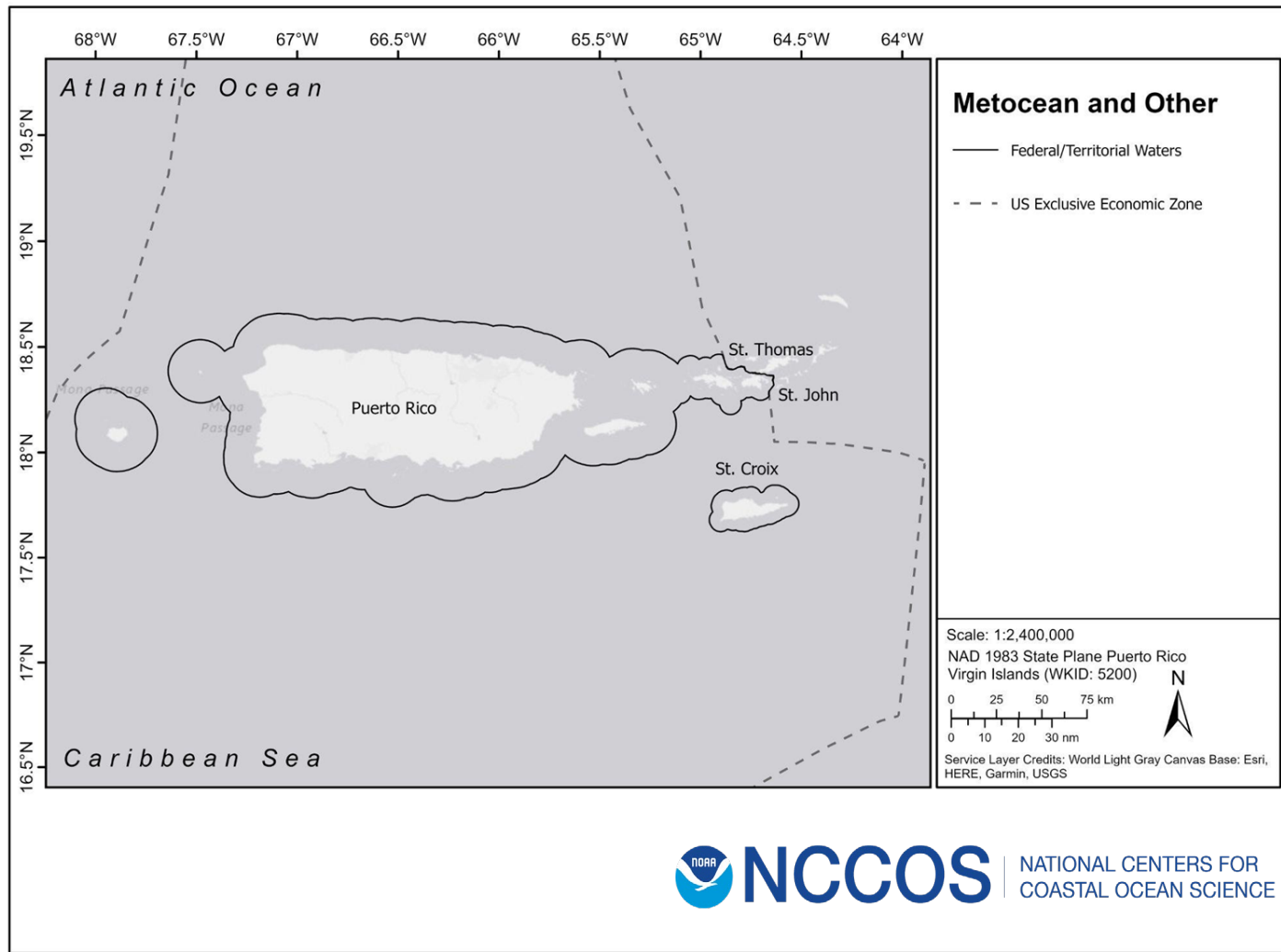James.Morris@noaa.gov
Jennifer.Wright@noaa.gov

Federal and State Waters

Summary: These data show the geographic representation of Federal and State Waters. The boundary between state and federal waters was determined by consulting The Submerged Lands Act (43 U.S.C. §§ 1301 et seq.), 48 U.S.C. §§ 1705 and The Abandoned Shipwreck Act (43 U.S.C. §§ 2101).

Type: Polygon

Original Source: BOEM, NOAA OCM

Data Link / Metadata Link

Metocean and Other

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

Atlantic Ocean

Mona Passage

Mona Passage

Puerto Rico

St. Thomas

St. John

St. Croix

Caribbean Sea

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

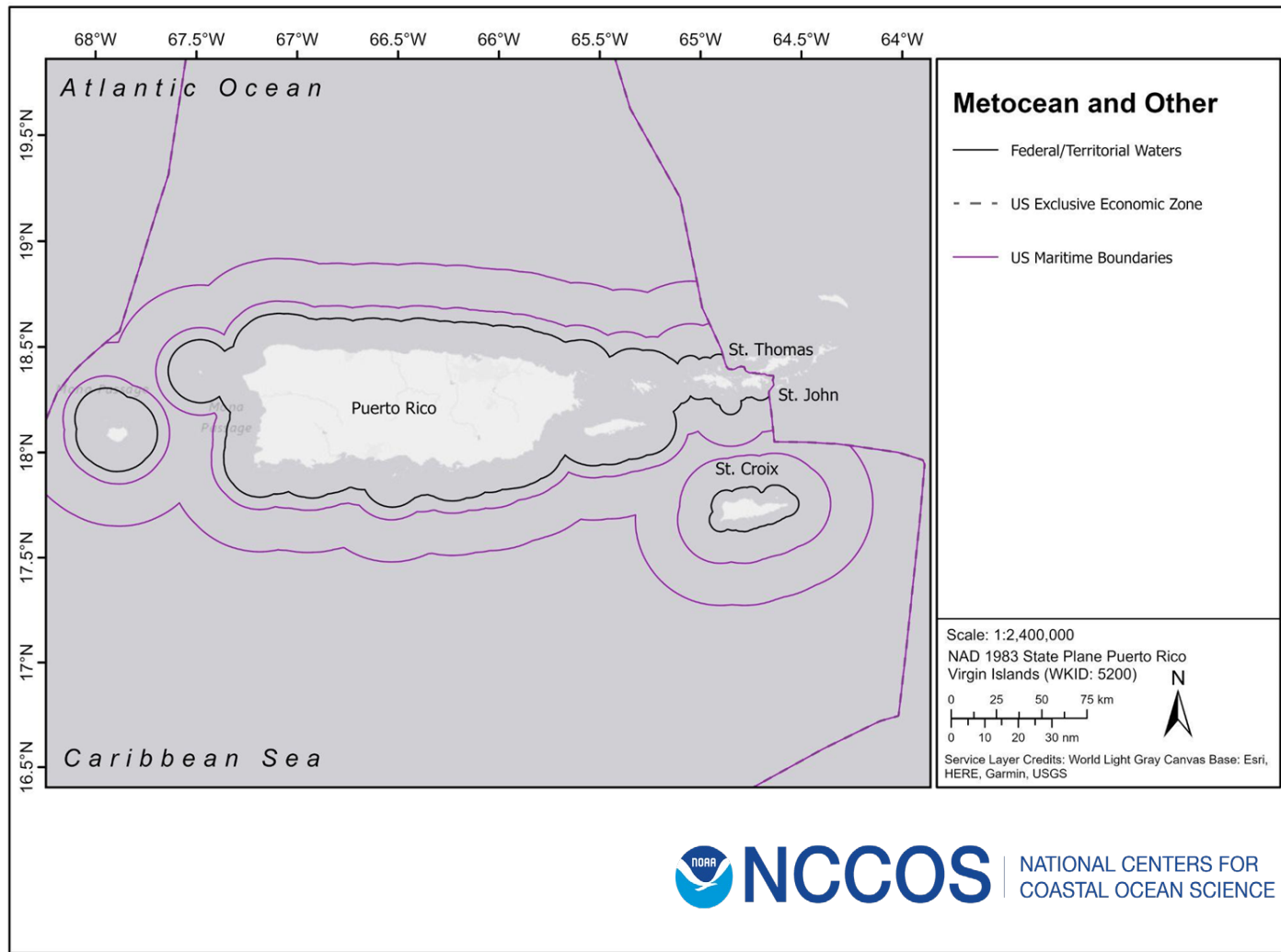NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

US Maritime Limits & Boundaries

Summary: Maritime limits and boundaries for the United States are measured from the official U.S. baseline, recognized as the low-water line along the coast as marked on the NOAA nautical charts in accordance with the articles of the Law of the Sea. The Office of Coast Survey depicts on its nautical charts the territorial sea (12 nautical miles), contiguous zone (24nm), and exclusive economic zone (200nm, plus maritime boundaries with adjacent/opposite countries).

Type: Polyline

Original Source: NOAA Office of Coast Survey

Data Link / Metadata Link

Metocean and Other

—— Federal/Territorial Waters

- - - US Exclusive Economic Zone

—— US Maritime Boundaries

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

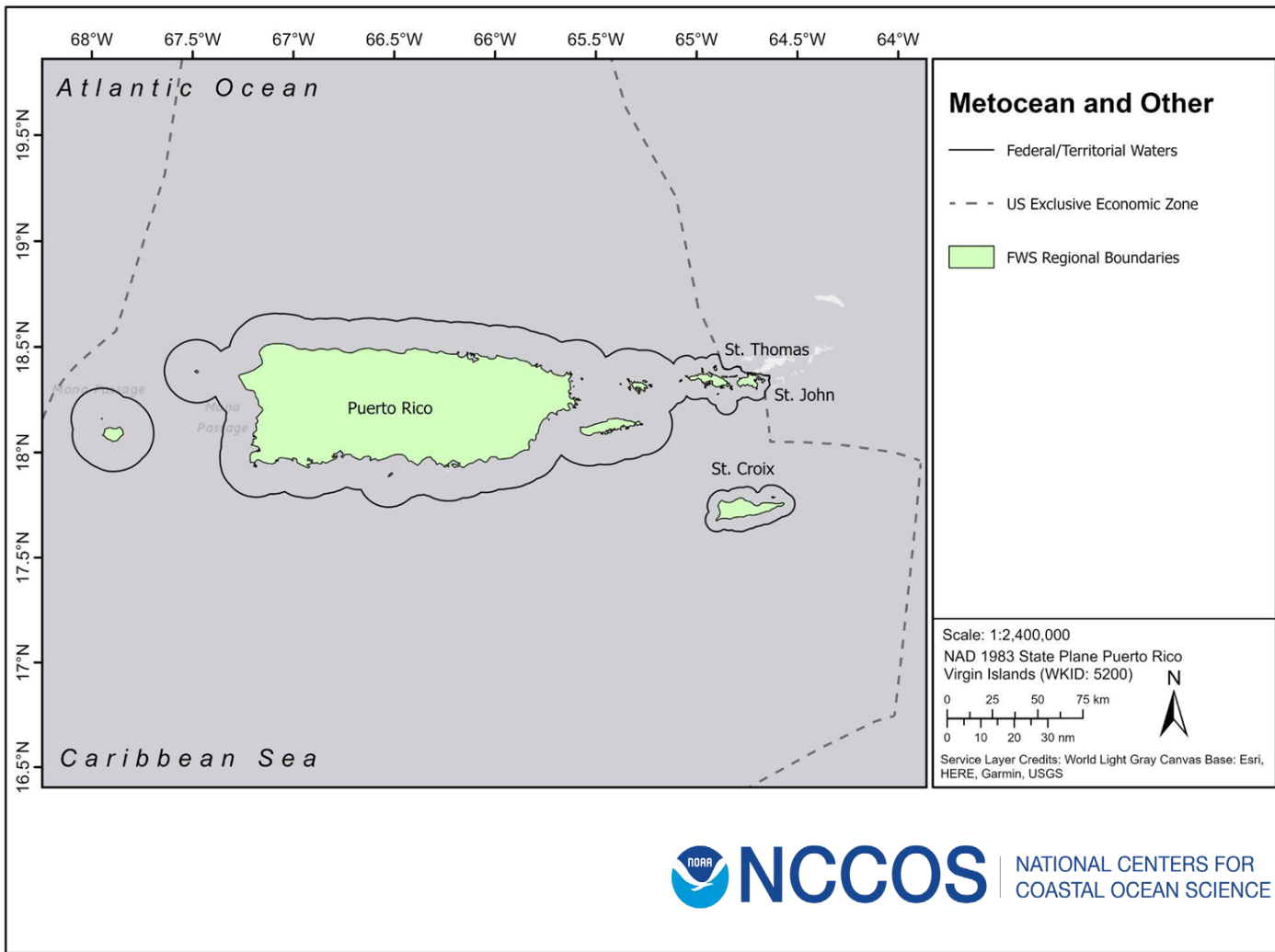Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

USFWS Regional Boundaries

Summary: Boundaries of the management Regions of the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service is organized into 8 geographic Regions.

Type: Polygon

Original Source: USFWS
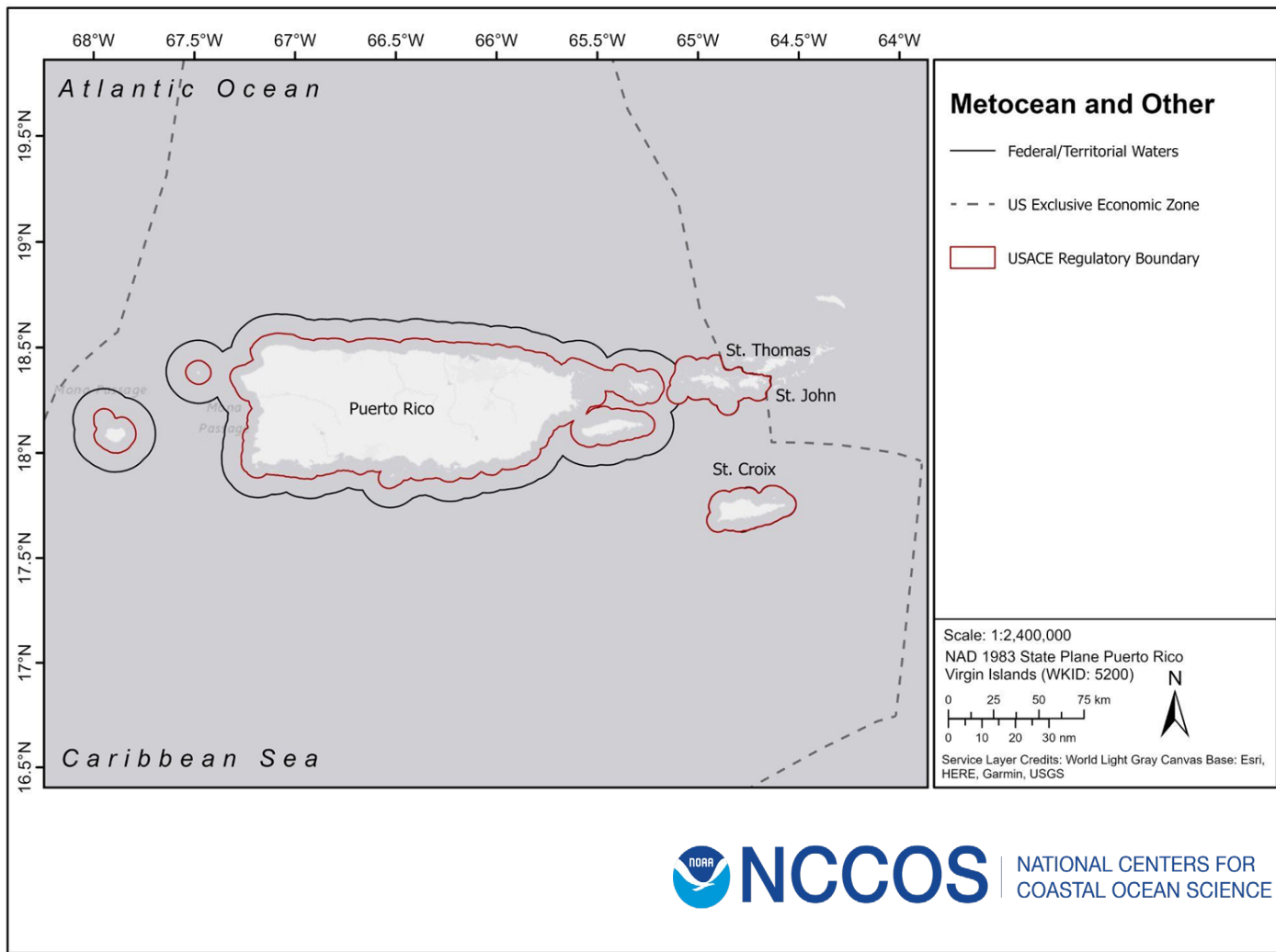
Data Link / Metadata Link

USACE Regulatory Boundary

Summary: The US Army Corps of Engineers has been regulating activities in the nation's waters since 1890. Until the 1960s the primary purpose of the regulatory program was to protect navigation. Since then, as a result of laws and court decisions, the program has been broadened so that it now considers the full public interest for both the protection and utilization of water resources. These boundaries represent USACE regulatory districts.

Type: Polygon

Original Source: USACE

Data Link / Metadata Link

Metocean and Other

— Federal/Territorial Waters

--- US Exclusive Economic Zone

☐ USACE Regulatory Boundary

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

US Counties

Summary: Boundaries of US Counties from the US Census Bureau.

Type: Polygon

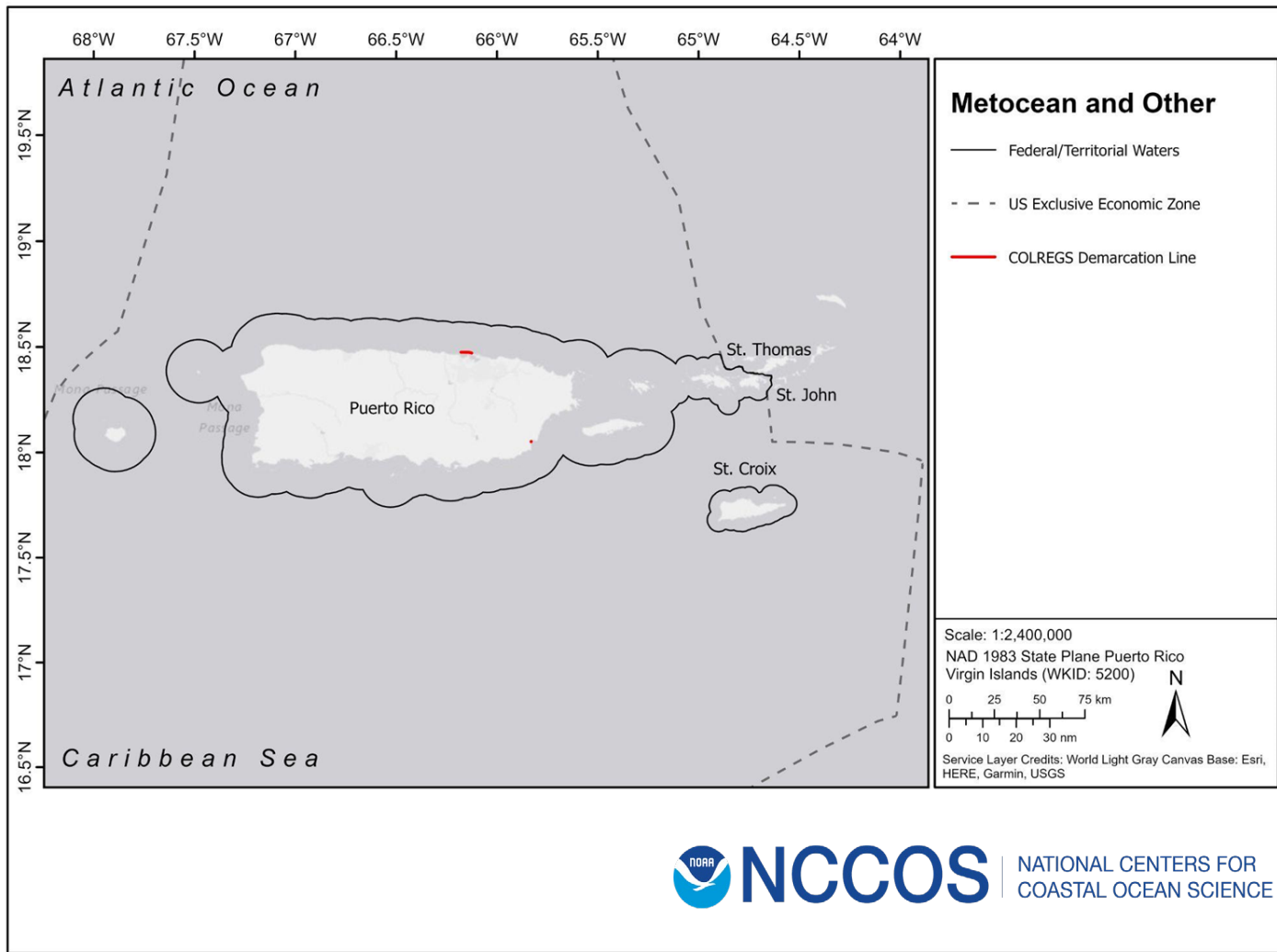**Original Source:** USFWS

Data Link
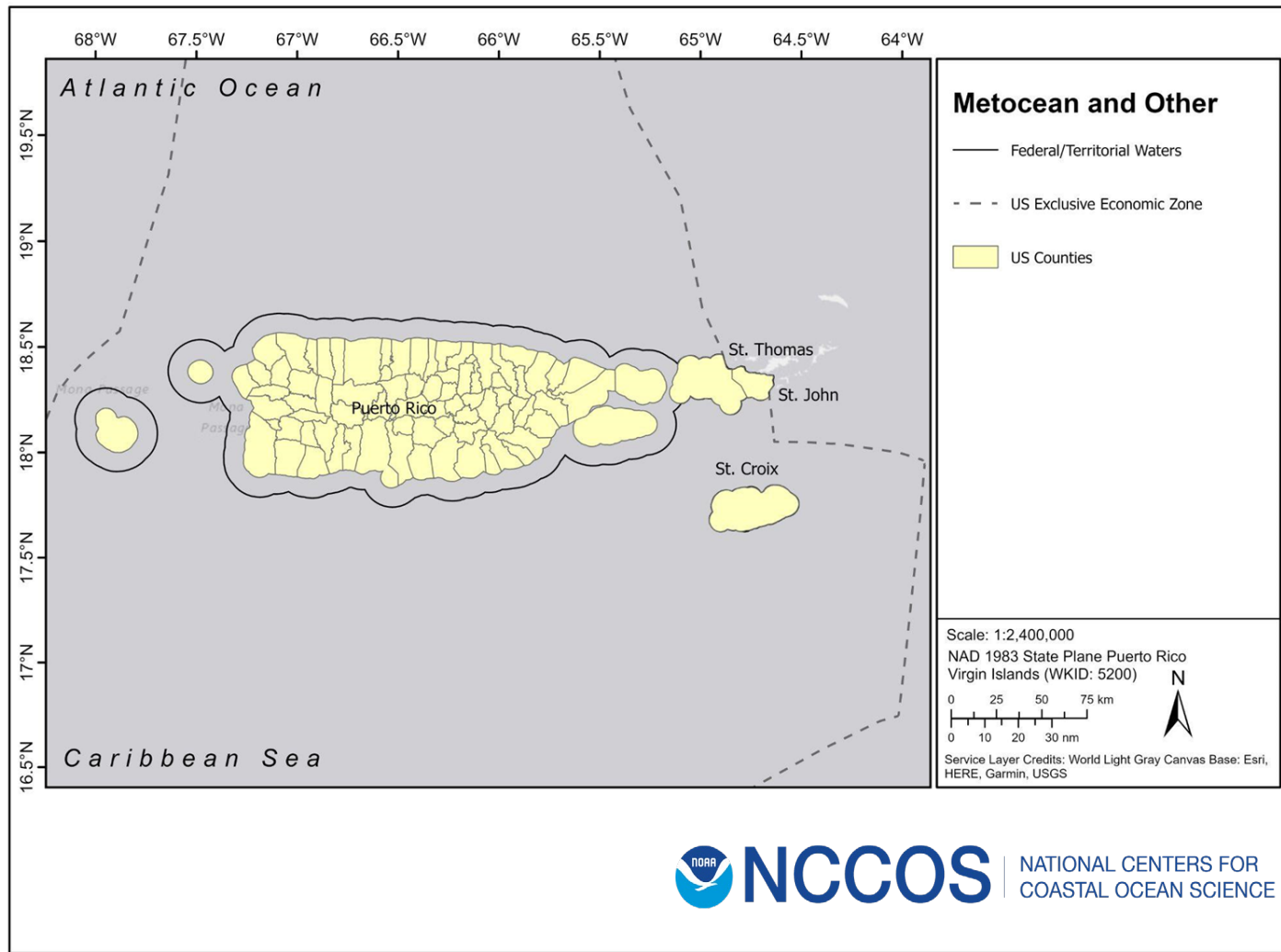
COLREGS Demarcation Line

Summary: U.S. collision regulation boundaries delineate those waters upon which mariners shall comply with the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS) and those waters upon which mariners shall comply with the Inland Navigation Rules. Records in this database are derived from descriptions published in the Code of Federal Regulations Title 33, Part 80 and are for planning purposes only.

Type: Polyline

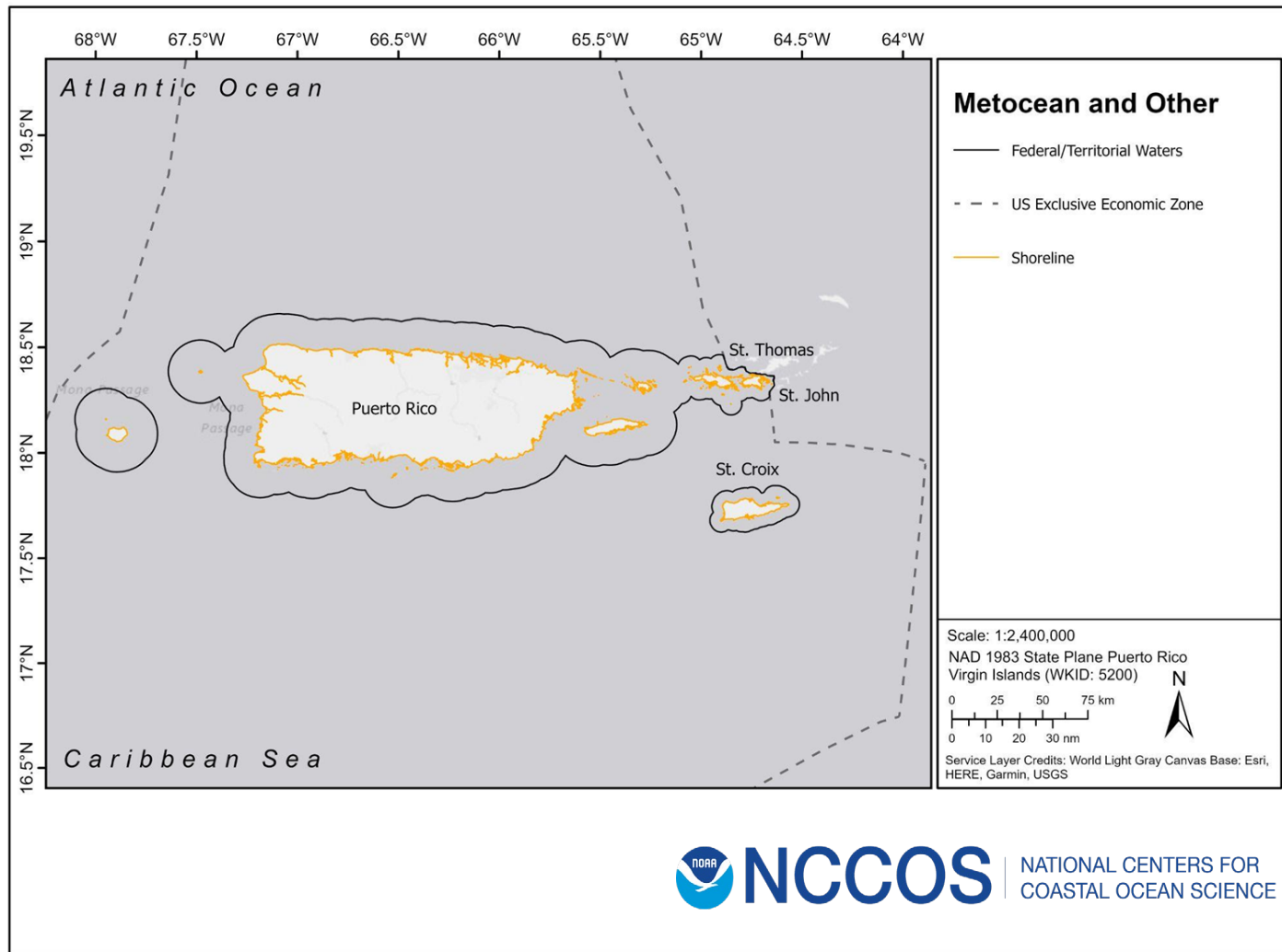**Original Source:** US Coast Guard, NOAA OCM, BOEM

Data Link

Metocean and Other

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

— COLREGS Demarcation Line

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0   25   50   75 km
0   10   20   30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri, HERE, Garmin, USGS

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Shoreline

Summary: National Geodetic Survey is building a database of its digital shoreline holdings.

Type: Polyline

Original Source: NOAA NGS

Data Link

Metocean and Other

— Federal/Territorial Waters

- - - US Exclusive Economic Zone

— Shoreline

Atlantic Ocean

Puerto Rico

St. Thomas

St. John

St. Croix

Mona Passage

Caribbean Sea

Scale: 1:2,400,000
NAD 1983 State Plane Puerto Rico
Virgin Islands (WKID: 5200)

0 25 50 75 km
0 10 20 30 nm

Service Layer Credits: World Light Gray Canvas Base: Esri,
HERE, Garmin, USGS

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Ports and Harbors

Summary: compilation of publicly accessible seaport information for ports and harbors in Puerto Rico and the US Virgin Islands.

Type: Point

**Original Source:** World Port Source

Data Link / Metadata Link
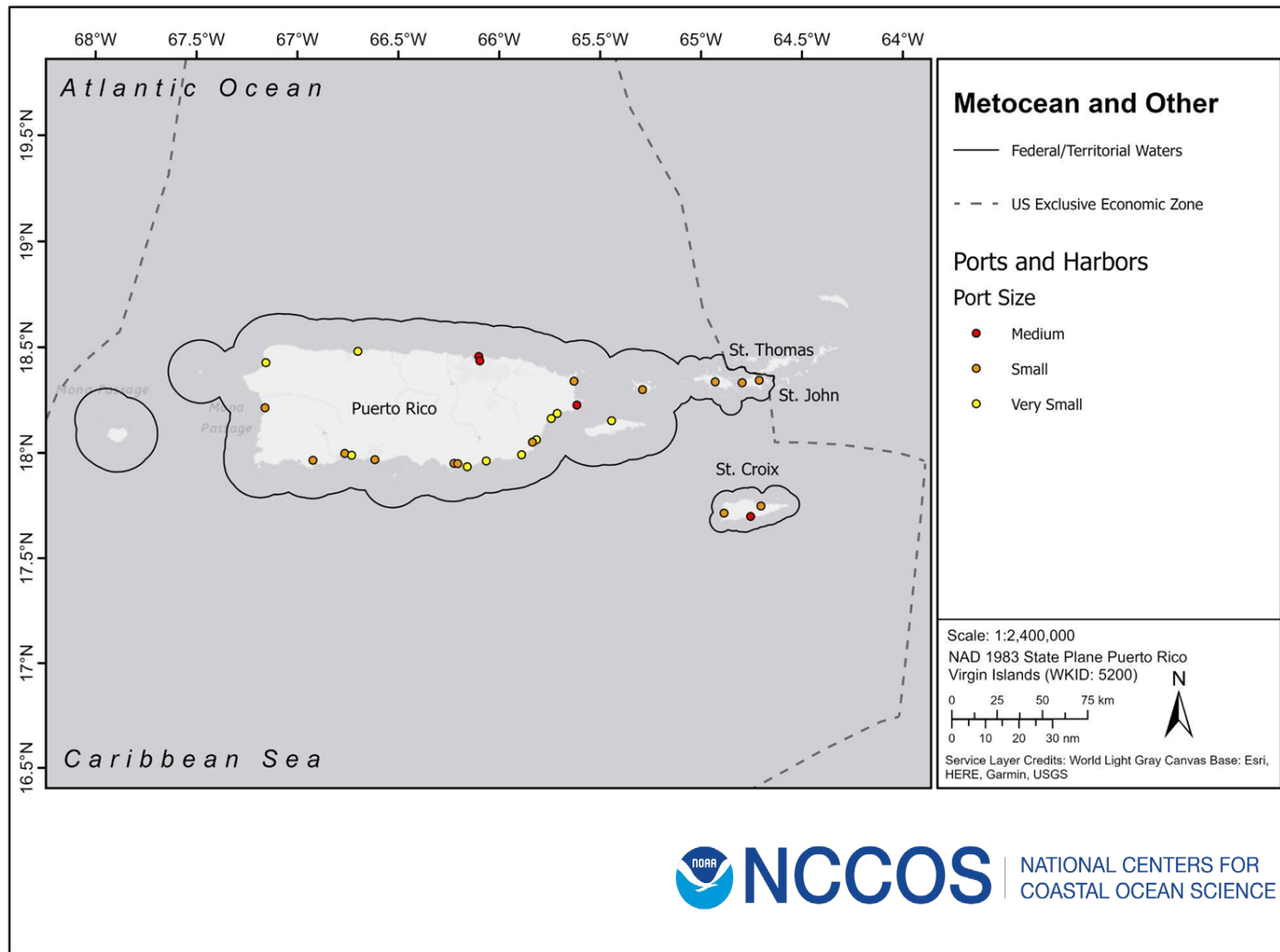
GEBCO Bathymetry

Summary: GEBCO's current gridded bathymetric data set, the GEBCO_2023 Grid, is a global terrain model for ocean and land, providing elevation data, in meters, on a 15 arc-second interval grid. It is accompanied by a Type Identifier (TID) Grid that gives information on the types of source data that the GEBCO_2023 Grid is based on.

Type: Raster

**Original Source:** GEBCO

Data Link / Metadata Link
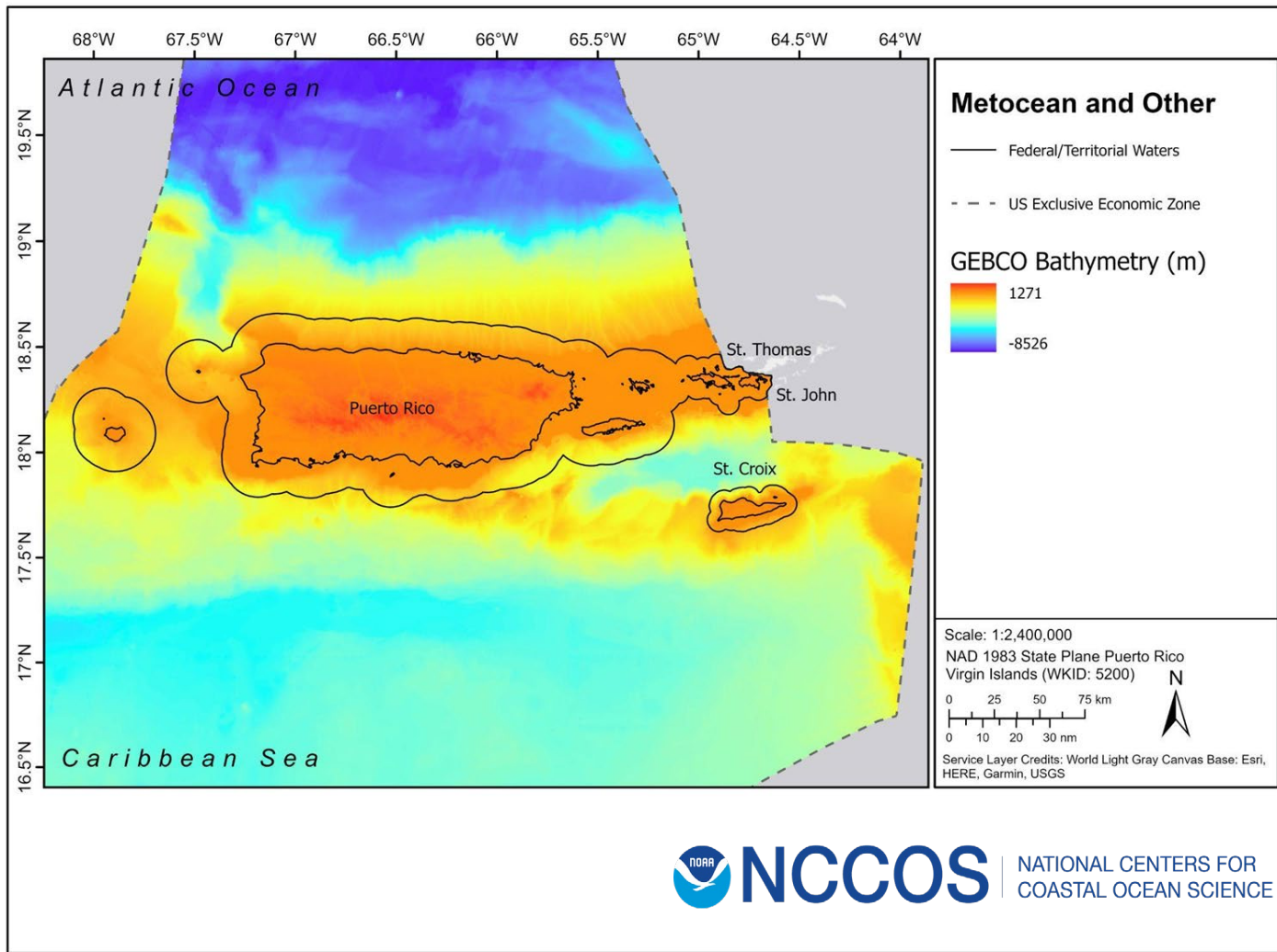
CRM Bathymetry

Summary: NGDC's U.S. Coastal Relief Model (CRM) provides the first comprehensive view of the U.S. coastal zone integrating offshore bathymetry with land topography into a seamless representation of the coast. Bathymetric and topographic data sources include: NGDC's NOS hydrographic surveys, multibeam bathymetry, and trackline bathymetry; the U.S. Geological Survey (USGS); and other federal government agencies and academic institutions.

Type: Raster

Original Source: NOAA National Geophysical Data Center NCEI

Data Link

NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE
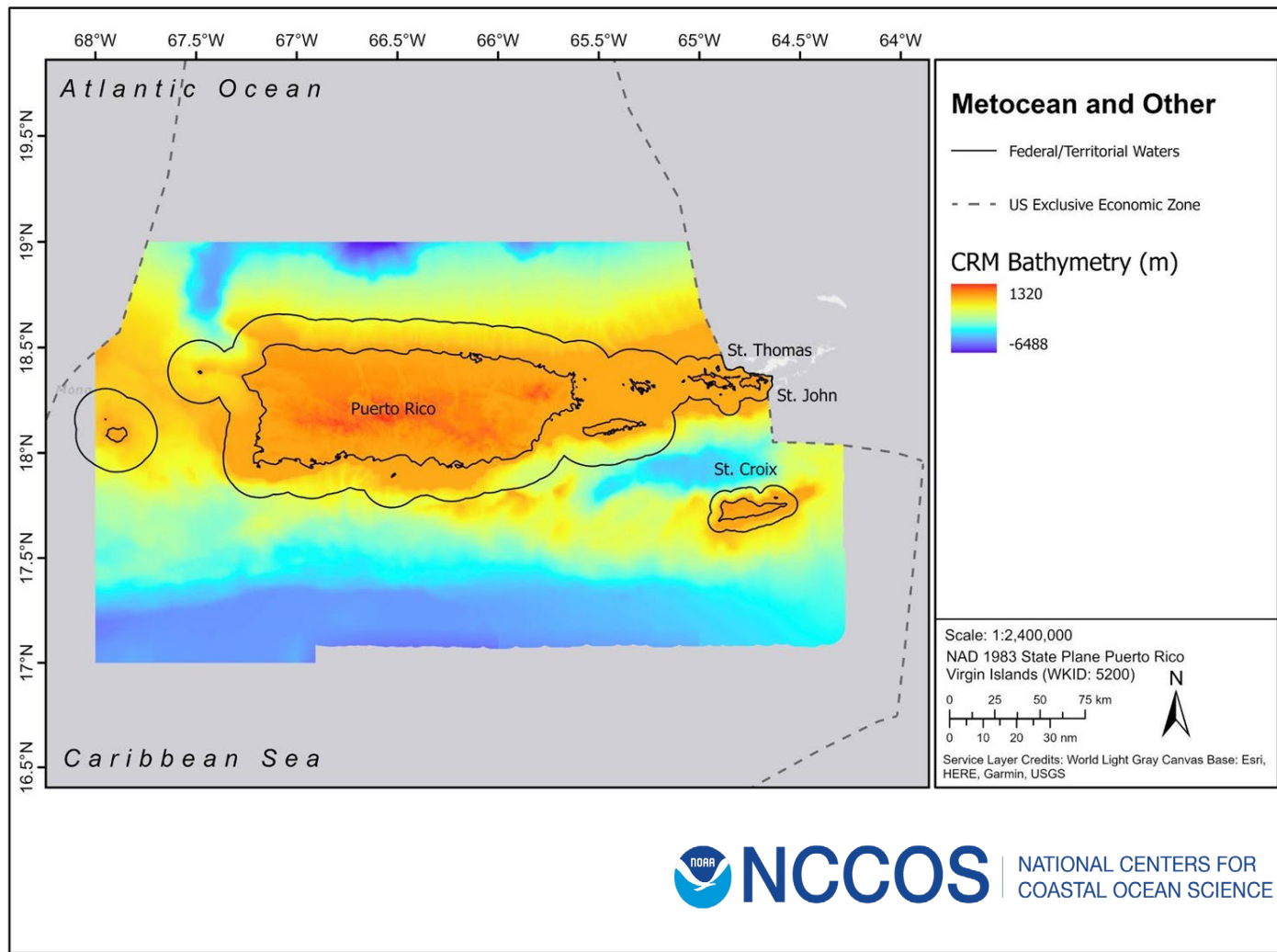
Buoys and HF Radar Stations

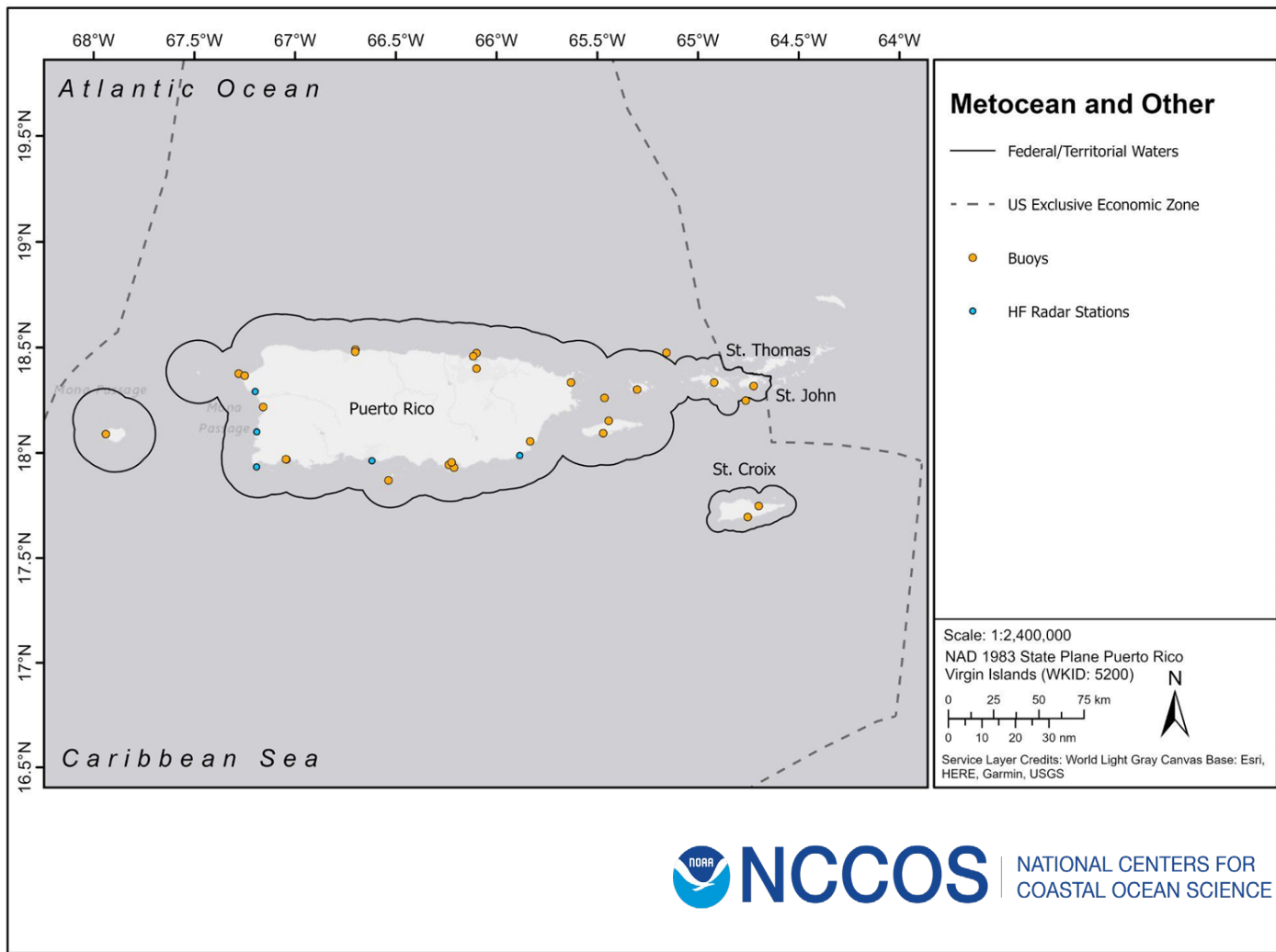**Buoys:** location of buoy stations in the US Caribbean.

Data Link

HF Radar Stations: HF Radar Network (HFRNet) is developed to manage and distribute in near-real time ocean surface currents measured by a distributed network of shore-based HF radar systems.

Data Link

Type: Point

Original Source: National Data Buoy Center, IOOS / UC San Diego

CARICOOS Data

CARICOOS Buoys
- Wind speed and direction
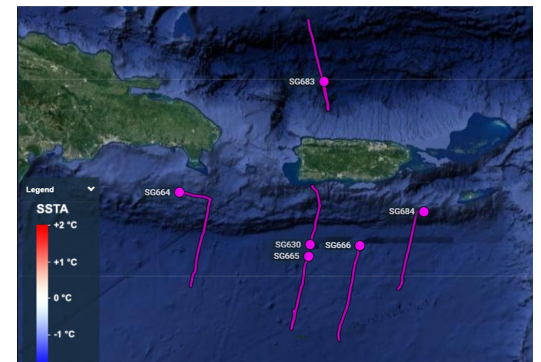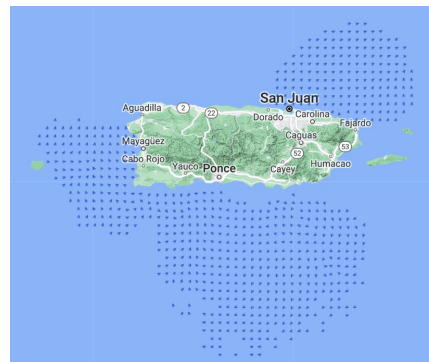- Tidal information
- Currents

HF Radar System
- Surface currents

Gliders
- Ocean temperature and salinity profiles
- currents, chlorophyll fluorescence, optical backscatter, and bottom depth

CARICOOS Link

Next Steps

1. Workshop report development
1. Distribute the post-workshop report (NCCOS website)
1. Distribute summary of data need priorities to funding sources (NOAA, BOEM, ….)
1. Follow up on data leads - Jennifer/NCCOS team will be in touch
1. Develop marine spatial planning data inventory/geodatabase
1. Develop US Caribbean MSP toolbox including interactive map viewer
1. Begin working with territory and federal governments on planning priorities (NMFS, DNER)
1. Continue working with BOEM on OSW planning priorities
1. Continue working with NMFS and DNER on aquaculture planning priorities
1. Consider research on co-siting as a way to reduce impacts
1. Establish future meetings virtual/in person targeted at specific data categories

Thank YOU for trusting us with your ocean intelligence